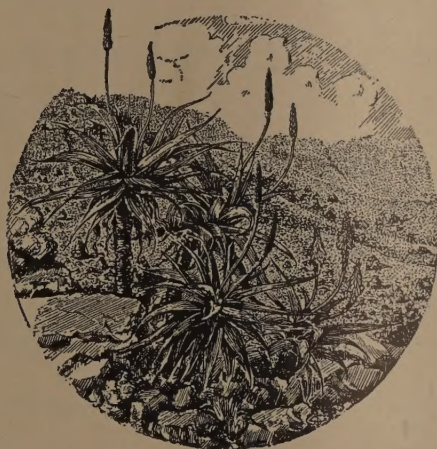


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A RECORD OF
CONTRIBUTIONS
FROM THE
NATIONAL HERBARIUM
UNION OF SOUTH AFRICA
PRETORIA



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Leaf Anatomy in the Grass Series Phragmitiformes (Harz) Avdulov.

By

J. M. J. de Wet.

The taxonomy of the Gramineae is by no means straightforward and is complicated by many factors. Due largely to a lack of data there is still no general agreement regarding the subdivision of the family into tribes or even subfamilies. The flowers are not showy, the component parts are often much reduced and the vegetative parts have reached a high degree of specialization. A close examination of the glumes, lemmas, paleae, lodicules, androecium and gynoecium reveals a wide degree of diversity among these organs. It is, therefore, not surprising that most systems of classification are based mainly on spikelet morphology. Recently, however, evidence regarding the relations of the species and genera has become available which differs conspicuously from most older observations. Leaf anatomy (Duval-Jouve, 1875, Pee-Laby, 1898, Grob, 1895-1897 and Prat, 1932, 1936) was proved to be useful in grass taxonomy. Similarly, Avdulov (1931) and Hunter (1934) indicated a close correlation between cytological data and the physiological observations of Trucel (1858) and Harz (1880-1882). More recently, Reeder (1946, 1953) combining with his own observations the data of Burns (1892) and Kennedy (1899) indicated that embryo anatomical observations may be used taxonomically. Reeder and von Maltzhan (1953) also pointed out that different types of root hair development were observed which allow for a subdivision of the Gramineae on the same lines as pointed out by Avdulov (1931) and Prat (1936). It is generally agreed among modern taxonomists that anatomy, cytology, genetics, ecology and physiology provide more reliable clues towards the true relationships in the Gramineae than spikelet morphology alone. Subdivisions based on gross morphology is essential for the easy and rapid identification of individual plants. Such is the recent classification of Pilger (1954). The leaf anatomy of the genera included in his subfamilies Festucoideae Hitchc., Micrairoideae Pilger, Oryzoideae Parodi, Olyroideae Pilger, Bambusoideae Krause and Anomochloideae Pilger will be discussed. An attempt will be made to evaluate the available data and supplement them with some personal observations in determining the phylogenetic position of some genera of controversial affinity.

The terms Panicoid type, Festucoid type, Eragrostoid type and Oryzoid type of internal leaf anatomy and epidermal histology were fully discussed by Prat (1936) and de Wet (1954, 1956a). The reader is referred to the diagrams later in this paper for more details.

MATERIAL AND METHODS: Specimens investigated were obtained from the National Herbarium, Pretoria. Slides were prepared according to the procedure outlined by Prat (1948). Drawings were made with the aid of a Camera Lucida.

Subfamily FESTUCOIDEAE.

1. **Festuceae - Festucinae:** *Lintonia* and *Cynosurus* were found to be Festucoid in all respects. The genera *Urochlaena*, *Lasiochloa* and *Plagiocloa* are characterized by the Festucoid type of internal leaf anatomy and the Panicoid type of epidermis. They are further characterized by truncate lodicules and ciliated ligules.

The genera *Lamarckia*, *Briza*, *Dactylis*, *Poa*, *Nephelochloa*, *Cutandia*, *Scleropoa*, *Vulpia* and *Festuca* are Festucoid in all respects according to Prat (1936). Prat (1936) also indicated a Panicoid type of leaf anatomy for *Uniola* and *Distichlis*, and a Festucoid type of chlorophyll distribution with variable epidermal traits in *Aeluropus* and *Fingerhutia*. Moffet and Hurcombe (1949) demonstrated a Eragrostoid type of leaf anatomy and cytology for *Tetrachne*.

Festuceae – Triodinae: *Plectrachne* and *Notochloa* are unknown cytologically and anatomically. Brown (1950) refers *Astrebula* to the Chlorideae because of its small chromosomes and basic number of $n = 10$. *Triodia* is characterized by $n = 8$ (Brown, 1950) and Burbidge (1946) demonstrated a Festucoid type of leaf anatomy.

Festuceae – Sesleriinae: The leaf anatomy of *Entoplocamia* and *Orcuttia* is of the Eragrostoid type. They are further characterized by ciliated ligules, large embryos and the grains are loosely enclosed by the lemmas and palea. Prat (1936) demonstrates a Festucoid type of epidermis and internal anatomy for the genera *Sesleria* and *Echinaria*. Myers (1947) lists large chromosomes with basic numbers $n = 7$ and $n = 9$ in these genera respectively. No data regarding chromosomes, anatomy and lodicules are available for the remaining genera included in this subtribe.

Festuceae – Beckmanniinae: Includes a single genus *Beckmannia* usually referred to the Chlorideae. Von Tieghem (1897), Avdulov (1931), Prat (1936) and Krishnaswamy (1941) indicated relations with the tribe Agrostae as recognized by Hubbard (1934). Reeder (1953) studied the embryo anatomy and indicates relations with the genera *Alopecurus*, *Phleum* and *Polypogon*.

Festuceae – Melicinae: Only two of the genera included in this subtribe have been studied. Morphologically *Melica* and *Schizachne* differ from the Festuceae in spikelet morphology. Their lodicules are truncate and vasculated, their stigma branches are broad and dichotomous, their caryopsis do not adhere to the palea and their embryos are relatively large. Both genera are characterized by the Panicoid type of histology. In the case of *Melica*, Avdulov (1931) demonstrated large chromosomes in multiples of $n = 9$.

Festuceae – Glyceriinae: *Pleuropogon* and *Glyceria* resemble the Festuceae in superficial characters but do not seem to be related to members of Festuceae. The chromosomes are medium large and Avdulov (1931) demonstrated $n = 9$ in *Glyceria* and $n = 8$ in *Pleuropogon*. Leaf anatomy is of the Festucoid type. *Poaegrostis* has been transferred by de Wet (1956a) to the Danthonieae. The genus *Puccinella* on the other hand is Festucoid in all respects (Prat, 1936). Furthermore, in the latter genus the lodicules have appendages, the embryo is small and the grain is tightly embraced by the hardened lemma and palea.

Festuceae – Psilurinae: The single genus *Psilurus* is characterized by a Festucoid type of leaf anatomy (Prat, 1936) and Avdulov (1931) demonstrated large chromosomes and a basic number of $n = 7$. Hubbard (1934) includes *Psilurus* together with *Pholiurus*, *Lepturus* and *Ischnurus* in the tribe Leptureae. Prat (1936) demonstrated that this tribe as recognized by Hubbard (1934) is completely Festucoid in all respects. Pilger (1954) retains *Pholiurus* in the subfamily Festucoideae tribe Monermeae. *Lepturus* and *Ischnurus*, however, Pilger (1954) refers to the Chlorideae, which evidently is incorrect.

Festuceae – Loliinae: Includes a single genus *Lolium* which is Festucoid in all respects. The cytology was investigated by Faworski (1927) and leaf anatomy by Prat (1936).

Festuceae – Bromineae: A truly Festucoid tribe according to Avdulov (1931), Prat (1936) and Myers (1947).

Festuceae – Streptogyninae: The single genus *Streptogyne* is unknown cytologically and anatomically.

Festuceae – Centothecinae: Both Pilger (1954) and Hubbard (1934) regards the Centothecinae as a subtribe of the Festuceae. It definitely does not belong here. Prat (1936) illustrates an Oryzoid type of leaf epidermis for *Centotheca*, *Lophatherum* and *Zeugites*. On the other hand, *Orthoclada* was found to have the Panicoid type of epidermis. Chlorophyll distribution is of the Festucoid type in all these genera. Avdulov (1931) demonstrated $n = 12$ in *Centotheca*, a cytology quite foreign to the Festuceae. In *Centotheca* the ligule is scarious, a Festucoid type of character, but the two lodicules are cuneate and without appendages which again are Panicoid characteristics.

Festuceae – Pommerculinae: The genus *Pommerculia* has not been studied.

Festuceae – Monanthochloinae: The single genus *Monanthochloe* is characterized by the Festucoid type of leaf anatomy but it differs from the Festuceae in spikelet morphology. The lodicules are truncate and the stigma branches are elongated.

2. **Triticeae – Henrardiinae:** The genus *Henrardia* is unknown cytologically and anatomically.

Triticeae – Eutriticinae: Prat (1936) and Avdulov (1931) indicated that the genera included in this tribe are characterized by all the peculiarities typical of the subfamily Festucoideae.

3. **Monermeae:** Only *Pholiurus* of the genera included in this tribe is known cytologically and anatomically. Prat (1936) indicated that this genus is Festucoid in all respects.

4. **Aveneae – Aveninae:** This subtribe has been fully discussed by de Wet (1954, 1956a). *Schismus*, *Afrachneria* and *Prionanthium* occupy an artificial position in the Aveneae.

Aveneae – Duthiinae: The single genus *Duthiea* has not been studied.

Aveneae – Danthoniinae: This subtribe was discussed by de Wet (1956a). A number of the genera included in this subtribe are still unknown anatomically and cytologically. Their phylogenetic position in the Gramineae is still uncertain.

5. **Arundineae:** A primitive tribe closely allied to the Danthoniinae (de Wet, 1956a). The morphological characters are peculiar and differ from those of typical members belonging to the subfamily Festucoideae. The lemmas are primitively awned from the sinus of the lobes, the ligule is ciliated, lodicules are more or less cuneate and vasculated and the stigma branches tend to be expanded and flattened in most species. Avdulov (1931) indicated a basic chromosome number of $n = 12$. Leaf anatomy, Prat (1936) and de Wet (1954) is of the Panicoid type.

6. **Arundinelleae:** The genera *Arundinella*, *Trichopteryx*, *Loudetia* and *Tristachya* are Panicoid in respect to leaf anatomy and morphology but resemble the Phragmitiformes of Avdulov (1931) in cytology (de Wet, 1954). *Danthoniopsis* on the other hand according to de Wet (1954) is Panicoid in all respects. The genus *Gilgichloa* has not been investigated.

7. **Thysanolaeneae:** The single genus *Thysanolaena* is characterized by the Panicoid type of epidermis and chlorophyll distribution. It is also Panicoid in respect of the grain which is free from the lemma and palea, the large embryo and lodicules which are cuneate. Typical Festucoid characters are the disarticulation of the spikelet above the glumes and the scarious rim which forms the ligule.

8. **Phalarideae:** *Ehrharta* and *Microlaena* are characterized by the Oryzoid type of leaf anatomy (Prat, 1936) and cytology (Avdulov, 1931). The remaining genera, Prat (1936), are typically Festucoid.

9. **Pappophoreae:** In the genera *Schmidtia* and *Enneapogon* the siliceous cells are Panicoid but the bicellular hairs are typically *Eragrostoid*. Prat (1936) recorded an *Eragrostoid* type of epidermis of *Cottea* and *Pappophorum*. Chlorophyll distribution is of the Festucoid type.

Small chromosomes and a basic number of $n = 10$ were recorded by Covas (1945) in the genera *Cottea* and *Pappophorum*. For the genera *Schmidtia* and *Enneapogon* de Wet (1956b) demonstrated a basic chromosome number of $n = 9$. In the latter two genera the stigma branches are stalked, the lodicules are cuneate and the embryo occupies $\frac{3}{4}$ or more of the length of the grain.

10. **Stipeae:** The chromosomes are mostly small but medium large in *Piptochaetium* and a few species of *Stipa*. The basic chromosome numbers are $n = 11$ in *Piptochaetium* and some species of *Oryzopsis*, while $n = 12$ in some other species of the latter genus (Johnson, 1945). In *Stipa*, Myers (1947), Brown (1949, 1951) and Ono and Tateoka (1953) demonstrate an aneuploid series, perhaps originally derived from $n = 6$ or $n = 5$. Internal leaf anatomy is of the Festucoid type and epidermal traits are variable (Prat, 1936).

11. **Nardeae:** Prat (1936) demonstrated a Festucoid type of chlorophyll distribution and *Eragrostoid* type of epidermis. Avdulov (1931) observed a basic chromosome number of $n = 13$ in the monotypic genus *Nardus stricta*.

12. **Coleantheae:** The single genus *Coleanthus* is *Eragrostoid* in respect of leaf anatomy. Lack of material made it impossible to study spikelet morphology.

13. **Lygaeae:** The monotypic genus *Lygaeum sparteum* has $n = 20$ and medium large chromosomes (Myers, 1947). Leaf anatomy is unknown.

14. **Phyllorachieae:** The genera included in this tribe were fully discussed by de Wet (1956b). It was pointed out that this tribe is closely related to the Oryzeae.

15. **Parianeae:** Contains a single tropical New World genus *Pariana* which is unknown anatomically and cytologically.

Subfamily MICRAROIDEAE: Tribe **Micraireae:** Includes a single genus *Micraira* which was not available for study.

Subfamily ORYZOIDEAE: Tribe **Oryzeae:** The genera *Oryza*, *Leersia*, *Potamophila* and *Zizania* are all characterized by the Oryzoid type of epidermis and Festucoid type of chlorophyll distribution. Kuwado (1910) and Ramanujam (1938) demonstrated a basic chromosome number of $n = 12$ in *Oryza*. A similar basic chromosome number and medium large chromosomes are also present in *Leersia* (Ramanujam, 1938). The remaining genera included by Pilger (1954) in this subfamily are unknown anatomically and cytologically.

Subfamily OLYROIDEAE: Tribe **Olyreae:** The genera *Pharus* and *Leptaspis* are characterized by the Panicoid type of epidermis. These genera are included by Hubbard (1934) in the tribe Phareae. Of the other genera belonging to the Olyreae, *Raddia*, *Lithachne* and *Olyra* are characterized by the Oryzoid type of epidermis. Chlorophyll is distributed according to the Festucoid type in all genera investigated.

Subfamily BAMBUSOIDEAE: This subfamily has been fully investigated by Prat (1936) who indicated a very peculiar type of leaf anatomy. Pilger (1954) also includes the tribe Streptochaeteae of Hubbard (1934) in this subfamily. The genus *Streptochaeta*, the only member of this tribe, has not been studied anatomically. Stebbins (Unpubl.) reports $n = 11$ chromosomes in one of the two known species of this genus.

Subfamily ANOMOCHLOIDEAE: This includes a single genus, *Anomochloa*. No data regarding cytology, anatomy or detailed spikelet morphology is available.

One tribe of the subfamily Eragrostoideae the Aristideae as recognized by Pilger (1954) also needs to be mentioned. Pilger (1954) includes the genera *Aristida*, *Amphipogon* and *Diplopogon* in this tribe. Only the genus *Aristida* was available for study. The basic chromosome number is $n = 11$ and $n = 12$ in *Aristida* according to de Wet (1954, 1956b). A further indication that this genus does not belong in the Eragrostoideae comes from a study of leaf anatomy. The chlorophyll distribution is of the Panicoid type, but epidermal traits are variable. For instance in *A. ciliata* it is Eragrostoid, in *A. barbicollis*, *A. bipartita* and *A. aequiglumis* the epidermis is of the Panicoid type and in species such as *A. gracilior*, *A. obtusa* and *A. sericans* the epidermis is typically of the Festucoid type.

SUBDIVISION OF THE PHRAGMITIFORMES: The family Gramineae has been subdivided at various times into two or more subfamilies or series. As early as 1810, Brown noted two main groups, the Panicoideae and Pooideae. Pilger (1954) recognizes nine subfamilies. Combining the evidence presented by Harz (1880-1882), Avdulov (1939), Prat (1936) and the data presented by numerous taxonomists on spikelet morphology at least four series become evident. The characteristics of these, the Phragmitiformes, Paniciformes, Eragrostiformes and Festuciformes were discussed by de Wet (1954).

The subfamily Festucoideae as recognized by Pilger (1954) includes a diverse group of species and genera. In the classification of the Gramineae the true Panicoids, true Festucoids and the true Eragrostoid-chloridoids constitute no problem. A number of tribes and genera, however, do not belong to any one of these distinct groups and these are lumped together into a miscellaneous series the Phragmitiformes (Avdulov, 1931). The more outstanding tribes and genera involved are discussed below. Their position in grass phylogeny was pointed out by Stebbins (1956).

1. **Streptochaeteae:** Includes a single tropical genus, *Streptochaeta*. It has 3 lodicules, 6 stamens, 3 stigmas and the palea is split nearly to the base. Bentham (1881) refers this genus to the Paniceae and Hackel (1889) to the Oryzeae. Hubbard (1934) indicates that it is distinct from both these tribes.

2. **Bamuseae:** The genera are distributed throughout the tropics and subtropics. A few genera extend into the temperate regions. As pointed out by Hubbard (1934) it includes genera with the most primitive floral structure, but they are highly specialized vegetatively. Spikelets are all alike, lemmas awnless or rarely awned from the tip, lodicules usually 3, and 3, 6 or more stamens are present. Most of the species studied are high polyploids on the basis of $n = 12$ (Myers, 1947). Hunter (1934) indicates $n = 9$ in a species of *Arundinaria*. Internal leaf anatomy, Prat (1936) is characteristic. Epidermal traits are variable, but more or less of the Panicoid type.

3. **Phareae:** This is a tropical tribe, probably of close common ancestry with the Bamuseae. As is recognized by Hubbard (1934) the genera *Pharus* and *Leptaspis* are included. The spikelets are 1-flowered, awnless and unisexual. The lodicules are mostly 3, stigmas 3 and stamens 6. The chromosomes are small and the basic number is $n = 12$ (Valencia ex Stebbins unpublished). The leaf anatomy is Panicoid.

4. **Olyreae:** This tribe differs from the Phareae in the reduction of the stamens to 3 or 2 and in the Oryzoid type of epidermis. It includes the genera as recognized by Hubbard (1934).

5. **Centothecae:** Anatomical characters are Festucoid in respect to chlorophyll distribution, but the epidermal traits are either Panicoid or Oryzoid. This tribe is recognized to include the genera *Centotheca*, *Lophatherum*, *Zeugites*, *Orthoclada* and *Magastachya*. Both Hubbard (1934) and Pilger (1954) combine these genera as a subtribe of the Festuceae.

6. **Parianeae:** Contains a single New world genus which was not studied. Hubbard (1934) indicates that *Pariana* resembles the *Hordeae* in superficial inflorescence characters. This genus appears to present a highly specialized end line.

7. **Anomochloae:** This tribe is recognized in the sense of Hubbard (1934) to include *Anomochloa merantoidea* of the Brazilian forest. This genus is incompletely known and it shows no close affinity with any other genus.

8. **Phyllorachieae:** Chlorophyll distribution is of the Festucoid type, epidermis of the Oryzoid type and the chromosomes are small in multiples of $n = 12$. As was done by Hubbard (1939) the genera *Phyllorachis* and *Humbertochloa* are included. This tribe resembles the *Oryzeae* closely not only in anatomy and cytology, but also in spikelet morphology and starch grains. For this reason it would appear as if they developed from a common stock and might well be united.

9. **Oryzeae:** The genera *Ehrharta*, *Microlaena* and *Tetrarrhena* should be added to the tribe as recognized by Hubbard (1934). The starch grains are angular, the chromosomes small and in multiples of 12 and the leaf anatomy is typical. *Ehrharta*, *Microlaena* and *Tetrarrhena* are southern in distribution and represent the most primitive members of the tribe. The tribe as a whole has reached a high degree of specialization in the tropics.

10. **Arundineae:** Is a very large tribe. To the genera included by Pilger (1954), the tribe *Danthoniaceae* as recognized by de Wet (1956a) could be added. In other words, as recognized by Pilger (1954) the subtribe *Danthoniinae* of the *Aveneae*, the genera *Schismus*, *Afrachneria* and *Prionanthium* of the *Aveneae* subtribe *Aveninae* and from the *Festuceae* subtribe *Glyceriinae* the genus *Poagrostis*. Further also the genera *Arundinella*, *Trichopteryx*, *Loudetia*, and *Tristachya* from Hubbard's (1934) tribe the *Arundinelleae*. These data were fully discussed by de Wet (1954, 1956a and 1956b). The leaf anatomy may be either Panicoid or Festucoid, the chromosomes are medium large and in multiples of 6 and 7 (Avdulov, 1931, Calder, 1937, Stebbins and Love, 1941 and de Wet, 1954). The genera are mostly temperate in distribution with a few montane species extending to the tropics.

11. **Stipeae:** Is recognized in the sense of Hubbard (1934) to include the genus *Aristida*, except that *Melica* is removed. This tribe may be subdivided into two distinct groups which appear to have developed independantly. The one group includes *Aristida* and the other the remaining genera.

12. **Unioleae:** Pilger (1954) includes *Uniola*, *Distichlis*, *Monanthochloe*, *Vaseyochloa* and *Aeluropus* in various subtribes of the *Festuceae*. The genus *Jouvea* which also belongs here, Pilger refers to the tribe *Jouveneae* of the *Eragrostoidae*. These genera from a natural group in having truncate lemmas with several parallel veins which often end in awns. They differ from members of the *Festucoideae* in leaf anatomy, cytology and spikelet morphology.

13. **Pappophoreae:** Besides the four genera placed by Hubbard (1934) in this tribe *Orcuttia* and *Neostaffia* are added. The epidermis is more or less *Eragrostoid* and the chromosomes are small in multiples of $n = 10$.

14, 15 and 16. **Lygeae**, **Nardeae** and **Micraireae:** These tribes consist of monotypic genera, all of which need further investigation. With the present evidence available they are difficult to place, but do not seem to be related to each other.

RELIC GENERA: A number of relic genera still remain to be discussed. These are *Schizachne*, *Melica*, *Pleuropogon*, *Glyceria*, *Fingerhutia* and *Coleanthus*. They are temperate in distribution and have vegetative characters resembling the true members of the *Festuciformes*. In the case of *Melica*, the chromosomes are as large as those of members belonging to the *Festuciformes*, but the basic chromosome number appears to be $n = 9$ (Avdulov, 1931).

That they do not belong in the Festuiformes is quite evident. Their lodicules are truncate and often vasculated, their stigma branches are broad and dichotomous, their caryopses do not adhere to the palea and the embryo is relatively large. In *Glyceria* and *Pleuropogon* the chromosomes are medium large with basic numbers 9 and 8 respectively (Avdulov, 1931).

The chlorophyll distribution is of the Festucoid type in *Melica* and of the Festucoid type in *Glyceria* and *Pleuropogon*. In *Melica* the epidermis is also of the Panicoid type and of the Festucoid type in the latter two genera. In *Fingerhutia* the epidermis is either of the Festucoid or the Eragrostoid type. In *Coeleanthus* the leaf anatomy is typically Eragrostoid.

Morphological, cytological and anatomical data suggest an affinity with the Pappophoreae. It would appear, however, as if they originated from the primitive Arundineae stock, as did the Pappophoreae. These genera, although showing superficial resemblances to the Festuceae, are not closely related to them.

TABLE 1.—A tentative key to the classification of the Phragmitiformes.*

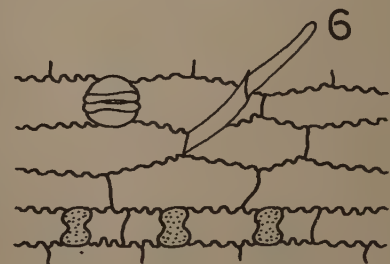
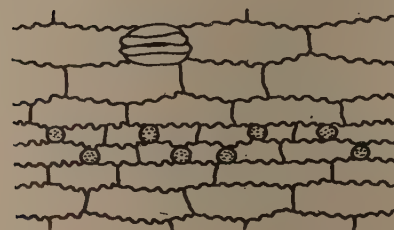
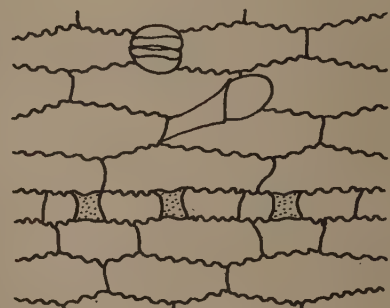
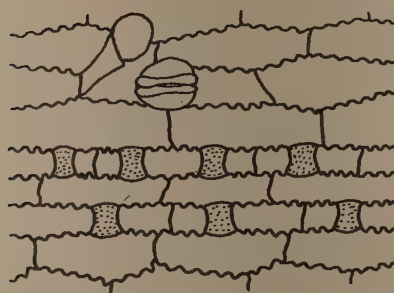
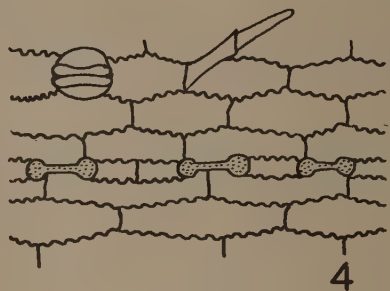
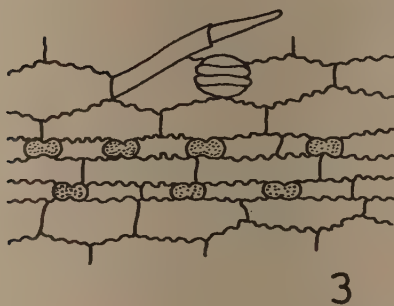
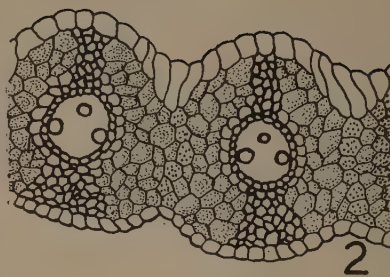
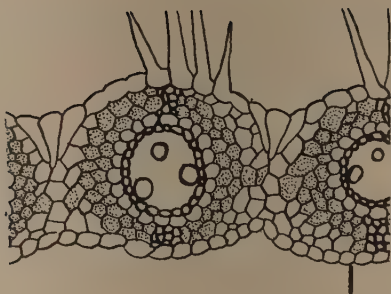
A. Leaves with cross veins; tropical. B. Palea split nearly to the base: Streptochaeteae. BB. Palea bilobed at the apex only. C. Plants arboreal: *Bambuseae*. CC. Plants not arboreal. D. Lodicules mostly 3; stigmas 3 or 2; spikelet with one functional flower. E. Stigmas 3; stamens 6: *Phareae*. EE. Stigmas 2; stamens 2 or 3: *Olyraeae*. DD. Lodicules 2; stigmas 2; spikelet with more than one functional flower: *Centothecaeae*. AA. Leaves without cross veins; tropical or temperate. F. Stamens 6 or more: *Parianeae*. G. Spikelets often enclosed in a sheath-like spathe. H. Stigma 1; stamens 4: *Anomochloaeae*. HH. Stigmas 2; stamens 6–4: *Phyllorachiaeae*, *Oryzaeae*. FF. Stamens 3. GG. Spikelets not enclosed by a spathe. I. Stigma 2. J. Lemmas with a single awn from the sinus between the lobes, awns reduced in some specialized groups. K. Spikelets with several florets: *Arundineae*. KK. Spikelets with a single functional floret; lemma indurated: *Stipeaeae*. JJ. Lemmas awnless or with several veins excurrent into awns. M. Lemmas awnless, laterally compressed: *Unioleaeae*. MM. Lemmas with several parallel veins, which usually end in awns; rounded on the back: *Pappophoreaeae*. II. Stigma 1. N. Spikelet solitary, surrounded by a sheath-like spathe: *Lygeaeae*. NN. Spikelets in spikes: *Nardeaeae*.

SUMMARY.

The leaf anatomy was investigated of a number of genera belonging to the series Phragmitiformes (Harz) Avdulov. Anatomical characters are found to be variable. Chlorophyll distribution is of the Panicoid or the Festucoid type. Epidermal traits may be of the Panicoid, Festucoid, Eragrostoid or Oryzoid type. The subfamilies Festucoideae, Oryzoideae, Olyroideae, Bambusoideae, Micrairoideae and Anomochloideae as recognized by Pilger (1954) are discussed. A number of genera and even whole tribes included by Pilger (1954) in the subfamily Festucoideae together with the other subfamilies are regarded as belonging to the series Phragmitiformes. Anatomical, cytological and morphological data support such a subdivision. The genera *Jouvea* and *Aristida* in the subfamily Eragrostoidae of Pilger are also transferred to the Phragmitiformes. The Phragmitiformes are classified and the affinities of the tribes pointed out. A key to the identification of these tribes is tentatively proposed.

It was pointed out that a miscellaneous group of grasses are lumped together in the Phragmitiformes. Most of these genera are more or less related to the true panicoids, true festucoids or the true eragrostoid-chloridoids. Others appear to be relic genera with no obvious affinities to these distinct groups of grasses.

* A number of relic genera and the tribe Micraireae have been left out of this key.



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LEGEND TO FIGURES.

FIGURES 1-2.—Semidiagrammatical drawings of leaf anatomy types, $\times 500$.

FIGURE 1.—Panicoid type.

FIGURE 2.—Festucoid type.

FIGURES 3-8.—Semidiagrammatical drawings of epidermal types, $\times 500$.

FIGURE 3.—Panicoid type; *Aristida barbicollis*.

FIGURE 4.—Panicoid type; *Aristida bipartita*.

FIGURE 5.—Eragrostoid type; *Aristida ciliata*.

FIGURE 6.—Eragrostoid type; *Fingerhutia sesleriaeformis*.

FIGURE 7.—Festucoid type; *Aristida gracilior*.

FIGURE 8.—Oryzoid type; *Olyra latifolia*.

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Notes on the Loganiaceae, Salvadoraceae and Oleaceae in South Africa.

By

I. C. Verdoorn.

1. NOMINATION OF NEOTYPE FOR *STRYCHNOS DECUSSATA* (PAPPE) GILG.

When describing *Atherstonea decussata*, the basionym of the above species, Pappe wrote at the foot of the botanical description (see Silva Capensis ed. 2: 29, 1862)—“Grows in the thickets and forests of Uitenhage, Olifants Hoek and elsewhere in the districts of the Eastern Province”. In a footnote he wrote “named in honour of Dr. W. G. Atherstone, of Grahamstown, a gentleman whose merits rendered to South African Botany and Geology rank high, and to whom I am under great obligations for valuable information towards this work”. The type or types of this species would therefore be a specimen or specimens from the mentioned localities collected by Pappe or annotated by him as being *Atherstonea decussata*. To date no such specimens have been found and it is probable that no material was preserved. From the excellent description there is no mistaking what tree Pappe was describing so there can be no doubt that it is the same species that Harvey described and figured in his *Thesaurus Capensis* 2: 41 (1863) as *Strychnos atherstonei* with Dr. Pappe's name as a synonym. One of the specimens cited by Harvey is “On the Kowie, Dr. Atherstone”.

Through the kindness of Prof. D. A. Webb, Trinity College, Dublin, I was able to examine this specimen. According to the notes and labels on it, the sheet contains two gatherings, both by Dr. Atherstone from a tree on the Kowie in the Bathurst district. The flowering material, which is mounted on the lower half of the sheet (and spare material which is in an attached envelope), Dr. Atherstone states was picked by him in November 1863 from the same tree from which he had sent a fruiting specimen earlier in the year. (NOTE.—This is a year after the publication of Pappe's species and therefore cannot be the specimen on which he based *Atherstonea decussata*.) This fruiting specimen is mounted on the upper half of the sheet but the fruit is missing.

It is the flowering material that I wish to nominate as the neotype of the species. There is duplicate material of it in the Kew Herbarium and a scrap in the National Herbarium, Pretoria. Neotype of *Strychnos decussata* (Pappe) Gilg.: Cape, Kowie, *Atherstone* s.n., flowering material, (TCD, neo.!, K, PRE, iso-neo).

2. THE RELATIONSHIP BETWEEN *STRYCHNOS INNOCUA* DEL., *S. DYSOPHYLLA* BENTH. AND *S. GERRARDII* N.E.BR.

In the Kew Bulletin 1938, page 46 Bullock and Bruce reduced *Strychnos dysophylla* Benth., together with a number of other described species and varieties, to synonymy of *S. innocua* Del. In 1956, after studying the tropical African specimens involved, Miss E. A. Bruce decided to exclude *S. dysophylla* Benth. (and three species which she regarded as being synonymous with *S. dysophylla*) from that long list of synonyms and again treat it as a separate species. Her views were published posthumously in the Kew Bulletin of that year on page 270 under notes by Bruce & Lewis. The main reason given is that it is “undesirable to conceal the variation” in this group.

A study of the South African material both in herbaria and in the wild leads to the conclusion that the broader view of *S. innocua* Del. can be more satisfactorily applied to the whole complex. If *S. dysophylla* Benth., with its southern distribution, is restored to specific rank the following are some of the difficulties that are encountered.

i. Specimens in the southern regions, prepared from different parts of the same tree or in different seasons, could be identified from the key, some as *S. innocua* and some as *S. dysophylla*.

ii. It is very difficult to decide to which of these two species the taxon which was described as *S. gerrardii* N.E.Br., and which occurs in Natal, is the more closely related, in other words, of which is it a subspecies or variety since it obviously belongs to the same complex and should not have specific status.

In connection with the first difficulty, *S. dysophylla* as defined by Bruce and Lewis differs generally from *S. innocua* ssp. *innocua*, of which, to date, there is no authentic record from southern Africa, in the following features: the branchlets usually smooth and dark, either brown or grey, instead of pale and farinose; contracted lateral branchlets present; lenticels conspicuous, leaves on the whole smaller, seldom over 7 cm long as against up to 15 cm long, and drying a dark colour; the inflorescence sessile instead of shortly pedunculate and the flowers only about 5 mm long instead of about 10 mm long. But there are exceptions and one or more characteristics of the tropical specimens may be found among specimens which, from the locality, or because of some other features, belong best to *S. dysophylla*. These exceptions seem to indicate that the differences are merely subspecific, that certain features have become accentuated on plants in the one region and another set in the other, so that, on general appearance, the specimens can, roughly, be separated into groups.

With regard to the second difficulty, *S. gerrardii* N. E. Brown differs from *S. innocua* ssp. *innocua* principally in the comparatively slender branchlets which are not fairnosed, the conspicuous lenticels and the narrower leaves and it agrees with this taxon in the normally developed branchlets and the peduncled inflorescences. These latter features seem more important taxonomically and they are the features in which it differs from *S. dysophylla*. Therefore it would seem to be more closely related to *S. innocua*. Yet Bruce and Lewis suggest (Kew Bull. 1956: 275) that *S. gerrardii* may be synonymous with *S. dysophylla* ssp. *engleri* (Gilg) Bruce and Lewis, giving it a closer relationship with *S. dysophylla*.

These difficulties are overcome if *S. dysophylla* and *S. gerrardii* are included in the compound species, *S. innocua*, and given subspecific status, the same rank as *S. innocua* subsp. *burtonii* (Bak.) Bruce and Lewis and *S. dysophylla* subsp. *engleri* (Gilg) Bruce and Lewis but under one species. This does not conceal the variation in the complex species and the objection expressed by Bruce and Lewis will be overcome.

New combinations will be necessary in this arrangement and are made below:—

S. innocua Del. subsp. *dysophylla* (Benth.) Verdoorn.

S. dysophylla Benth. in Journ. Linn. Soc. 1: 103 (1857).

Type: Delagoa, *Forbes* s.n.

S. innocua Del. subsp. *gerrardii* (N.E.Br.) Verdoorn.

S. gerrardii N.E.Br. in Kew Bull. 1896: 162 (1896).

Type: *Medley Wood* 5624 (K, lecto, PRE fragment lecto!).

I nominate *Medley Wood* 5624, the sheet in the Kew Herbarium seen by Brown and of which there is a portion in the National Herbarium, Pretoria, as the lectotype of *Strychnos gerrardii* N.E.Br., selected from the following syntypes: Berea, *Medley Wood* 5624; Cult. *Medley Wood* 1777; without locality *Gerrard* 1421.

3. SINKING THE GENUS *CHILIANTHUS* UNDER *Buddleia*.

The three genera *Nuxia*, *Chilianthus* and *Buddleia* as defined in the *Flora Capensis* (Vol. 4, 1: 1037) are obviously closely related and *Chilianthus* is the link between the other two genera which, by themselves, would be easily distinguishable. Being the intermediate group it is not surprising to find that its members have at different times been classified under either *Nuxia* or *Buddleia*.

Bentham classified all 4 known species of *Chilianthus* as *Nuxia* species (see Comp. Bot. Mag. 2: 60, 1836) and from Burchell's unpublished notes on his specimens it can be seen that he identified the two *Nuxia* species he collected, *N. floribunda* Bth. and *N. congesta* R.Br. ex Fres., as "*Chilianthus*". When describing the new genus *Chilianthus* (see Travels 1: 94 (1822), Burchell contrasted it only with *Scoparia* and did not mention *Nuxia* or *Buddleia*.

The view that *Nuxia* and *Chilianthus* are congeneric can hardly be justified, for although in general appearance the flowers in both genera are similar, having the corolla tube short and the stamens exserted, yet in the leaves, general habit and certain other details they are markedly dissimilar. For instance in *Nuxia* the anther-cells are confluent, the corolla circumscissile near the base, and there are no stipules present, whereas in *Chilianthus* the anther-cells are distinct, the corolla not circumscissile and there are stipules, or at least interpetiolar ridges, present.

The view, on the other hand, that *Chilianthus* and *Buddleia* are conspecific has proved on investigation, to be feasible.

In 1946, E. P. Phillips reduced the genus *Chilianthus* to a synonym of *Buddleia* (see Journ. of S.A. Bot. 12: 113). When doing so he showed that in the last analysis the only character by which these two genera could be separated is the exserted stamens of *Chilianthus* as against stamens included in *Buddleia*, and then, he continues, that in one known *Chilianthus*, *C. corrugatus*, "the anthers are very little exserted". He points out too that in most of the known classifications, such as Genera Plantarum and Pflanzenfamilien, the close relationship of *Chilianthus* and *Buddleia* is emphasized.

On first thoughts one may be inclined to wonder why *Chilianthus* and *Buddleia* should not remain distinct since in South Africa the two groups are easily distinguished, for all our known species of *Buddleia* have flowers with a tubular corolla and stamens included while the *Chilianthus* species have short campanulate corolla-tubes and at least the anthers exserted. But a study of the whole genus *Buddleia* reveals that the representatives in Africa are not typical of the genus as represented in America and, as Dr. Phillips also pointed out, differ almost as much from the type species, *B. americana*, as they do from the species placed in *Chilianthus* in S. Africa. From this it is obvious that the two groups of species in South Africa can at most be treated as two sections of the genus *Buddleia*.

4. REASONS FOR AGAIN REDUCING THE GENUS *LACHNOPYLIS* TO *NUXIA*.

In the Kew Bulletin, 1930 C. A. Smith resuscitated *Lachnopylis* Hochst. which Bentham had reduced to *Nuxia* Lam. giving his reasons for considering it generically distinct from this monotypic genus. These reasons have never seemed very convincing.

In several publications on the tropical African flora, Smith was followed, for example by Robyns in the *Flora of the Parc National Albert*, Vol. 2: 59 (1947), and Brenan and Greenway in *Check-List of the Forest trees and Shrubs of the British Empire* No. 5, 2: 270 (1949). On the other hand, when dealing with the specimens in the Mascarene Islands, that is in the region where both genera occur, *Nuxia* on Mauritius and Reunion and *Lachnopylis* on Madagascar and the Comoro Islands, Paul Jovet retains the name *Nuxia* for all the species and treats *Lachnopylis* as a sub-genus of *Nuxia* (see for instance *Notulae Systematicae* 13: 97 (1947)).

Further, the systematists at present working on the *Loganiaceae* for the "Flora of Trop. East Africa" have independently come to the decision that *Lachnopylis* is not generically distinct from *Nuxia* and so all the tropical African species are to be placed in the genus *Nuxia* in that work.

With these two supporting opinions, and for the sake of uniformity in Africa it has been decided to re-instate *Nuxia* in the South African Flora as well.

The taxonomic reasons for favouring this treatment are that the points of similarity between *Nuxia verticillata*, the type species of the genus, and the species in the Mascarenes and Africa which Smith would refer to *Lachnopylis*, seems to be of more significance as generic characters than are the differences.

The similar features are: ternate leaves; inflorescence of compound cymes; a tubular calyx with erect lobes and lined with appressed hairs; the corolla circumscissily deciduous from near the base; and the anther-cells confluent. A combination of some or all of these features are convincing as generic characters. The most important differences are that *Nuxia verticillata* has the corolla-tube longer than the calyx with the style included in the corolla-tube as against the calyx being longer than the corolla-tube in all the other species with the style exerted from both calyx and corolla.

These are hardly generic differences especially since the general appearance of the flower is the same in both groups, the corolla-lobes reflexing in *N. verticillata* exactly as in the others, although the calyx does not reach to the point where they reflex; and if one takes the relationship of the style to the persistent calyx instead of to the deciduous corolla it is longer than the calyx in both groups. These differences seem no more than specific but might be regarded as worthy of some higher (sub-generic) ranking if all the species, including those in the Mascarenes, are studied.

Under the present treatment the following combination is necessary:—

***Nuxia glomerulata* (C.A.Sm.) Verdoorn** for *Lachnopylis glomerulata* C. A. Smith in Kew Bull. 1930: 24 (1930).

Although C. A. Smith described 8 new species under *Lachnopylis* in the above mentioned publication it has been found, now that the genus is better known in the wild, that only this one (*L. glomerulata*) can be maintained as a species. Of the other seven, one, *L. suaveolens* C.A.Sm., is a synonym of *L. glomerulata* and the rest have been reduced under the very variable and widespread, but characteristic, species *Nuxia congesta* Fres.

This wide view of *N. congesta* conforms to that of the workers on the Flora of Tropical East Africa.

5. NEW STATUS FOR *SALVADORA AUSTRALIS* SCHWEICKERDT.

Comparison of the specimens of *Salvadora australis* Schweickerd (Bothalia 3, 3: 248, 1938) with the description and figure of the Madagascar species *S. angustifolia* Turrill (Kew Bull., 1918 and Flora Madagascar, 1946), shows a great similarity especially in features such as the shape and spread of the leaves and the presence of well developed glands between the filaments. These are the very features which characterize *S. australis* and distinguish it from *S. persica* L. Through the kindness of Dr. Renaud Paulian I was able to examine two specimens of *S. angustifolia* from Madagascar which he sent on loan to the National Herbarium, Pretoria. This confirmed the similarity between the specimens from the two countries and the only evident difference noted was the persistent, short, dense pubescence on the South African specimens as compared with the glabrous or partly scaly specimens from Madagascar.

Pubescence in this family is not usually of specific significance and, in most cases, does not warrant even subspecific distinction, but the nature of the pubescence and the remoteness of the areas of distribution seem, in the case under consideration, to justify varietal separation. The following combination is therefore made:—

***Salvadora angustifolia* Turrill var *australis* (Schweick.) Verdoorn** stat. nov. *S. australis* Schweick. in *Bothalia* 3, 3: 248 (1938).

6. LECTOTYPE OF *JASMINUM BREVIFLORUM* HARV. EX WRIGHT.

In the revision of the Oleaceae, *Bothalia* 6: 549 (1956), I wrote in the introduction on page 549, concerning the authorship of certain species, that, in my opinion, Harvey should get the credit for them rather than the publishing author. I felt that since Harvey supplied the descriptions these were parallel cases to those cited under Recommendation 46B of the 1956 Code of Botanical Nomenclature. While I still abide by my decision in the case of *Menodora juncea* which was published post humously in Harvey's *Genera Plantarum* ed. 2, 1869, I now feel that in connection with *Jasminum breviflorum*, *J. Gerrardii* and *Olea enervis*, it is more correct to cite the authority as "Harv. ex Wright" and therefore if abbreviating "Wright" should be cited.

My reasons are: (1) That "in Wright in *Flora Capensis*" may not be what is intended by "in a work by another author (see Rec. 46B)". (2) I have no proof that Wright did not change Harvey's descriptions to some extent; (3) at least in one case Wright cites a specimen that Harvey could not have seen; and (4) if Harvey is cited as author there is uncertainty about the holotypes.

The reviewed treatment, that is citing the author in these cases as "Harv. ex Wright", requires the selection of a type for *J. breviflorum* since Wright cited 2 specimens. I here select the sheet in the Kew Herbarium of Burke from the Magaliesberg which has on it a label reading "seen by Dr. W. H. Harvey" and written to the left of this label the word "type".

Notes on the Genus *Royena* in South Africa.

By

B. de Winter.

During a study of the accumulated material of this genus in the National Herbarium, Pretoria and in the Kew Herbarium, London, it became evident that the treatment and delimitation of the species in the *Flora Capensis* 4 (1906) was no longer satisfactory. The following notes are the result of a study of plants in the field and also of the ample herbarium material available for study.

The most important characters in distinguishing species are in the fruits and mature leaves, and fruiting specimens are therefore best suited for identification. In contrast to those of many other groups, the floral parts of *Royena* are variable within the species especially in size, and show hardly any characters of diagnostic value on the specific level. The distribution of the species was found to be a very useful aid in confirming the identification of incomplete or very young specimens.

A wider concept of species has simplified identification and what is more important, has, in my opinion, presented a truer picture of the relationship of the various taxa to each other.

The discussion of the sex of the flowers of *R. glabra* in *Journ. S. Afr. Bot.*, April, 1953 by Salter has been corroborated by the study of other species in the field as well as in the herbarium. All the species have proved to be dioecious, with functionally male flowers, and female flowers with staminodes borne on different plants. The female plants, which are in the minority in all the populations studied in the field, and also in material in herbaria, never have pollen and are therefore truly female. The functionally male plants are apparently hermaphrodite since they very often have fairly well developed ovaries which, however, normally do not ripen into fruits and soon abort. Fruits have been noticed occasionally on male plants and have proved to have some apparently fertile seeds. It seems best therefore to refer to the species as subdioecious as has been done by other authors.

The treatment of the genus in the *Flora Capensis* lists 17 species. This number has now been reduced to 13.

A full account with keys and descriptions will be published in the forthcoming *Flora of Southern Africa*.

NEW COMBINATIONS AND VARIETIES.

***Royena cordata* E. Mey. ex DC. var. *scabrida* (Harv. ex Hiern) de Winter comb. nov.**

Basionym. *R. scabrida* Harv. ex Hiern in *Trans. Cambr. Phil. Soc.* 12, 82 (1872).

***Royena lycioides* (Desf.) A. DC.**

(a) subsp. *sericea* (Bernh. ex Krauss) de Winter comb. nov.

Basionym. *R. sericea* Bernh. ex Krauss in *Flora* 27, 824 (1844).

(b) subsp. *guerkei* (O. Ktze.) de Winter comb. nov.

Basionym. *R. guerkei* O. Ktze. *Rev. Gen. Pl.* 3, 2, 196 (1898).

(c) subsp. *nitens* (Harv. ex Hiern) de Winter comb. nov.

Basionym. *R. nitens* Harv. ex Hiern in Trans. Cambr. Phil. Soc. 12, 87 (1873).

Royena hirsuta L.

(a) var. *microphylla* (Burch.) de Winter comb. nov.

Basionym. *R. microphylla* Burch. Trav. 1, 348 (1822).

(b) var. *rubriflora* de Winter var. nova var. *microphyllae* et var. *hirsutae* affinis, a var. *microphylla* foliis maioribus differens, ab ambabus floribus coccineis, nec roseis modo var. *microphyllae* nec *cremeis* modo var. *hirsutae*.

Type: Natal. Mont aux Sources, lower slopes of Drakensberg, flowers port-wine red. Aug., 1930, Hutchinson, Forbes and Verdoorn No. 4 (PRE, holo) = Hutchinson 4483 in K.

Royena villosa L.

var. *parvifolia* de Winter var. nov., var. *villosae* affinis foliis minoribus minus 3-5 cm longis, fructibus minoribus differt.

Type: Transvaal, Soutpansberg: Elim, plants supported by other trees, Obermeyer 713. (Tvl. Mus. No. 28377 in PRE, holo).

The distribution of this variety is limited to the Northern and North-eastern Transvaal.

A NEW SPECIES OF ROYENA.

Royena acocksii, species nova affinis *R. ramulosae* sed ita differt: folia multo maiora subtus sparsissime strigosa ramuli subglabris rubri-brunnei, flores semper tetrameri corolla calyci subaequali vel quam calycem paululum maiore.

Rigidly branched shrubs up to 15 ft. high. *Branches* straight, spreading at nearly right angles, bark smooth to finely rugose, ashgrey with blackish markings to grey with a reddish brown tinge; young branches smooth, deep mahogany red, glabrous or with a few scattered adpressed hairs. *Leaves* alternate, very shortly but distinctly petiolate, 1.0 cm to 2.0 cm long and 0.5 cm to 1.0 cm broad, elliptic to obovate-elliptic, glossy, coriaceous, finely rugose and glabrous above, more or less smooth and sparsely strigose below (young leaves densely strigose); margins usually slightly undulate, entire, often involute; nerves inconspicuous except for the midrib and sometimes faintly marked secondary nerves. *Flowers* tetramerous, solitary in the axils of the leaves, functionally male (apparently hermaphrodite) or female with the stamens reduced to staminodes, pendulous, up to 1 cm long but mostly shorter, peduncles 0.5 cm to 0.7 cm long, sparsely strigose; bracts 2, more or less approximate, up to 0.5 cm long, oblanceolate. *Calyx* deeply divided, lobes 4, triangular, 0.4-0.5 cm long and 2.5 mm wide at the base, sparsely strigose outside, glabrous inside, rather thick in texture. *Corolla* creamy white, urceolate, four-angled, slightly hairy on the angles, otherwise glabrous; tube short ($\frac{1}{2}$ length of flower); lobes very broadly ovate with an acute apex, distinctly imbricate. *Stamens* 8, 3.0 mm long, filaments very short and broad, glabrous; anthers lanceolate, 2.5 mm long, hairy on the back, less so on the inside face, dehiscing by longitudinal slits. *Ovary* borne on a distinct disc, four-angled, pyramidal, when more mature very broadly oblong, glabrous, or sparsely hairy on the angles; style as long as the four branches or slightly shorter. *Fruits* 1.0-1.3 cm long, glabrous, broadly oblong to semi-globose, slightly 4-angled, occasionally dehiscing along the four sutures which are visible as four fine but distinct lines. *Calyx* accrescent, $\frac{1}{2}$ the length of the fruits, lobes ovate, apices acute, more or less reflexed. *Seeds* strongly laterally compressed, 8 (or fewer), glabrous blackish, shiny.

CAPE PROVINCE.—Little Bushmanland; (Pella) near dry stream bed, bush 12-15 ft. high, *Pearson* 3546 (K). Kenhardt: Five miles north of Pofadder in the "Orange River Broken Veldt" of rocky hills, shrub up to 10 ft. high alt. 3,300 ft., *Acocks* 14395 (PRE holo; Isotype in K.); 126 miles from Kenhardt, *Pole Evans* 2259 (PRE).

SOUTH WEST AFRICA.—Warmbad district: beside streamlet (dry watercourse!) on farm Witzand, *Galpin* 14149 (K, PRE); 20 miles from Warmbad on Goodhouse road, shrub, 6 ft. high *Galpin* s.n. (K, PRE).

R. acocksii is a very distinct species with tetramerous flowers and relatively small, leathery, inconspicuously nerved leaves with undulate margins. It can be distinguished easily from the tropical spp. of *Royena* with tetramerous flowers by the much smaller subglabrous leaves. Two of the South African species can have tetramerous flowers, one of which, *R. glandulosa*, shows very little resemblance to *R. acocksii*. In *R. glandulosa* the calyx lobes are much accrescent and exceed the fruits in length, and the young parts are covered with glands. The second species, *R. ramulosa*, only occasionally has tetramerous flowers but there is a certain similarity in the leaves and fruits which suggests an affinity with *R. acocksii*. Their climatic requirements are also similar, but *R. acocksii*, is confined to the arid areas near the Orange River in the northern Cape Province and north of the river in South West Africa, while *R. ramulosa* has a wider distribution.

THE LECTOTYPE OF *R. PALLENS* THUNBERG.

R. pallens Thunberg Prodr. 80 (1794).

Syn. *R. brachiata* E. Mey. ex DC. Prodr. 8, 213 (1844).

In the *Flora Capensis* Hiern took a very broad view of this species, including as synonyms, amongst others, *R. pubescens*, *R. lycioides* and *R. sericea*. Of these I regard the first two as distinct and the latter as a subspecies of *R. lycioides*. The other synonyms given by Hiern are referable to one or other of the three species. There are fruit and leaf characters distinguishing these two species and their distributions are also fairly well defined. At least part of the confusion which existed in *R. pallens* can be attributed to the fact that four different plants are present on the three sheets in Thunberg's herbarium. Sheet 1 consists of two twigs of the species referred to by E. Meyer and published by DC. as *R. brachiata*. Sheet 2 consists of three twigs of *R. pubescens* Willd. and a loose fruit of *R. lucida*. The short description "*R. foliis oblongis obtusis glabris margine revolutis*" could equally well be applied to sheet 1 and to the specimens of *R. pubescens* on sheet 2. Sheet 3 consists of a rather atypical twig of *R. pubescens* and a twig of *Rhoicissus cirrhiflorus* (L.f.) Gilg. & Ben. and is therefore excluded as a possible lectotype. Since sheet 1 and 2 are equally eligible for selection as the lectotype on other grounds, the lectotype should be selected "so as to preserve current usage" App. 1d. of the 'Rules' (1952).

By choosing sheet 1 as the lectotype of *R. pallens* it is possible to retain the name *R. pubescens* Willd. in its currently accepted sense. If on the other hand sheet 2 is chosen, *R. pubescens* becomes a synonym of *R. pallens* and the species on sheet 1 will have to be referred to as *R. brachiata*—a name which has not been in current use since its inception.

Sheet 1 is therefore chosen as lectotype and the name *R. pallens* becomes restricted to a rather localised species so far recorded only from the Knysna, Port Elizabeth, Uitenhage and Bathurst districts.

New and Interesting Records of African Flowering Plants.

By

Various Authors.

ASCLEPIADACEAE.

Ceropegia occulta R. A. Dyer sp. nov., affinis *C. caffrorum* Schl. habitu crassiore, alabastro obtusiore, corollae lobis latioribus coronae lobis interioribus oblongo-ellipticis obtusis differt.

Herba perennis simplex vel sparse ramosa. *Tuber* 1·5–4 cm diam. *Rami* ad 20 cm longi, procumbentes vel suberecti nonnunquam volubiles, 2 mm crassi. *Folia* sessilia vel brevissime petiolata, carnosa, late ovata-vel lineari-lanceolata, 1–2 cm longa, 3–10 mm lata, acuta. *Flores* 1–2 extra folii axillam exorti, erecti, pedicillis 1 cm longis. *Sepala* lineari-lanceolata, 3–3·5 mm longa. *Corolla* 2–2·8 cm longa, apice obtusa; tubus 1·5–2 cm longus, basi ovoideo-inflatus, plus minusve 5 mm diam., in media parte 2·5–3 mm diam. in faucibus 5·6 mm extra et intus glaber; lobi 6–7 mm longi, apice per 2 mm connati, basi et apice 3·5 mm lati, medio 2·5 mm lati, intus breviter pubescentes, carinati. *Coronae exterioris lobi* poculiformes; 0·5 mm lati cum lobis interioribus connati; coronae interioris lobi incumbenti-erecti, 2·5 mm longi, oblongo-elliptici, obtusi, subcarnosi.

PLATE I.

CAPE PROVINCE.—Worcester Division; near Tweefontein, foothills under bushes, Van Breda 85 (PRE, type); Erens and van Breda 2264 (photograph).

Plants forming one to several subglobes tubers 1·5–4 cm in diam. with a few fibrous roots. *Stems* 1–4 from each main tuber, up to about 20 cm long, rarely showing signs of twining, 2 mm thick; lower internodes 2–6 cm long, towards apex of branches reduced to about 1 cm long or less. *Leaves* sessile or subsessile very variable in shape, the broadest towards the base ranging from nearly circular to ovate to linear-lanceolate, 1–2 cm long, 3–10 cm broad, fleshy, grooved down face, convex on lower surface, acute. *Cymes* laterally produced at nodes, subsessile, 1–2-flowered; flowers produced successively, sometimes the second aborted; pedicels up to about 1 cm long, glabrous. *Sepals* linear-lanceolate, 3–3·5 mm long. *Corolla* 2–2·8 cm long, very slightly curved or straight with tube 1·5–2 cm long, inflated at base to about 5 mm diam. 2·5–3 mm diam. above and spreading at the mouth to 5–6 mm; glabrous inside and outside, finely longitudinally ribbed within the inflation; lobed portion in bud 5–8 mm long with a slight constriction about the middle and a flattened united apical portion, apiculate; lobes about 3·5 mm broad at base and the same towards apex, 2·5 mm at middle, united for 2 mm at apex forming cap about 4 mm wide, apiculate in middle, each lobe shortly hairy within the margin and keeled down the inner face with the keel broadened to 1·5 mm at the base; margins only slightly replicate leaving comparatively small apertures between the lobes. *Corona* appearing as one series; outer corona of small spreading pockets about 0·5 mm wide, confluent with the base of inner lobes; inner lobes incumbent-erect, narrowly oblong-elliptic, 2·5 mm long, obtuse, somewhat fleshy. *Pollinia* subglobose, about 0·25 mm diam. with narrow amber-coloured inner margin which extends into a minute apical point (a feature not observed previously).

It is remarkable that this species of *Ceropegia*, which grows closest to the first port of entrance to the Union at Cape Town, should be among the last to be named specifically. No earlier record of the species seems to exist than a collection by P. A. B. van Breda shortly before 1950. He found it well hidden—hence the name—under the protection of karoo shrublets near Tweefontein in the Worcester district. In 1950 he and Mr. J. Erens, then head gardener of the Division of Botany, gathered more material at the same site for cultivation in Pretoria. This material flowered in September of the same year and although it was photographed, no herbarium specimen appears to have been preserved at the time.

In June, 1956, Mr. van Breda made further collections on request. A few flowers were present at the time and the holotype consists of this material, and duplicates were made when the plants continued to bloom at the Division of Botany, Pretoria, during February, March and April of 1957. Although the species appears to have a fairly long flowering period, it grows slowly and is not very floriferous. Under natural conditions the stems are relatively short and rarely show signs of twining, whereas under cultivation the stems are more robust and twine when placed on a support.

It seems that *C. occulta* is nearest in affinity to *C. caffrorum* Schl. and its allies in the eastern Cape Province near Uitenhage. It differs from these in the shape of the corolla lobes and the obtuse cage-like structure they form, and also in the more fleshy obtuse inner corona lobes. The pollinia are specially interesting. It is readily distinguished from *C. africana* R. Br., figured in the Botanical Register 626 (1822), and since recorded from near Oudtshoorn, by the falcate inner corona lobes of the latter.

R. A. DYER.

CALLITRICHACEAE.

Callitriche bolusii Schonl. et Pax ex Marl., Flora S. Afr. II, ii: 141 (1925).

The valid publication of this name seems so far to have been overlooked. It was first rendered as *Callitriche bolusiana* Schonl. et Pax in a note in Engl. Pflanzenw. Afr. III, ii: 169 (1921), but in Marloth's Flora under *C. bolusii* there is a series of line drawings which make it possible to identify the plant without doubt. Contrary to Marloth's observations the plant is restricted to the eastern Cape Province and has not been found in the Transvaal.

MAYDA HENDERSON.

COMPOSITAE.

Helichrysum albirosulatum Killick, sp. nov., affine *H. flanaganii* Bolus, sed habitu robustiore, foliis argenteo-albis, floribus majoribus paucioribus differt.

Fruticulus prostratus, ad 6 cm altus, omnino indumento argenteo-albo vestitus. *Folia* rosulata, plerumque spathulata interdum obovata, 1.4–2.2 cm longa, 5–6 mm lata, apice acuta vel obtusa plus minusve uncinata, basi attenuata. *Pedunculi* suberecti, 8 cm longi, foliati. *Corymbi* polycephali, semi-globosi, 1.3–1.5 cm diam. *Capitula* 5 mm longa, 2.5–3 mm lata. *Involucri bracteae* 3-seriatae, erectae, aureo-flavae, ab exteriore gradatim majores. *Flores* hermaphroditi, 10–12, aureo-flavi; corolla tubulosa, supra ampliata. *Achaenia* papillosa, breviter pubescentia.

NATAL.—Underberg District: rocky slopes of Bamboo Mountain, McLean 697. Estcourt District: top of Little Berg, 6,000 feet, Cathkin Park, Galpin 11838. Bergville District: Cave Sandstone outcrops, 5,500 feet, Cathedral Peak Forest Influences Research Station, Killick 1919 (PRE, type).

A prostrate, much-branched shrublet, up to 6 cm high, covered all over with a silvery-white, somewhat glossy, very closely felted indumentum. *Leaves* rosulate, spatulate or sometimes obovate, 1.2–2.2 cm long, 4–6 mm wide, apex acute or rounded, somewhat hooked, base attenuate. *Peduncles* suberect, 6–12 cm long, leafy. *Corymbs* many-headed, semi-globose, 1.3–2 cm diam., densely araneous underneath. *Capitula* 5 mm long, 2.5–3 mm wide. *Involucral* bracts in 3 rows, erect, golden-yellow at the tips; outer broadly elliptic, 4.5 mm long, 2 mm wide, subtended by a single large obovate bract 5 mm long, 2.5 mm wide; median ovate, 4 mm long, 2 mm wide; inner linear-lanceolate, 3.5 mm long, 1 mm wide, apex reflexed. *Florets* hermaphrodite, 10–12, golden-yellow; corolla tubular, widening above; pappus of numerous bristles successively shorter towards base; anthers with an acute appendage at apex, acuminate tails at base; style branches truncate. *Achenes* papillose and shortly pubescent.

Helichrysum albirosulatum seems to be restricted to Cave Sandstone outcrops in the Drakensberg area. Usually it is found on the “pavements” situated along the edge of the “Little Berg,” the terrace immediately below the main escarpment. This species with its numerous silvery-white rosettes forms extensive mats, which are a conspicuous feature of Cave Sandstone Macchia with *Passerina montana*, *Protea roupelliae* and *Erica* spp. as dominants. The known distribution of *Helichrysum albirosulatum* is between Bamboo Mountain, Underberg, in the south, and Cathedral Peak in the north. It was first collected by E. E. Galpin in March, 1932.

It differs from its nearest ally, *H. flanaganii* Bolus, in that the plant is more robust, the indumentum silvery-white and somewhat glossy instead of dull grey and in having florets which are larger and fewer per head (10–12 instead of 30 or more).

Helichrysum drakensbergense Killick, sp. nova, distinctissima, nullis e specibus notibus propinqua.

Herba decumbens, ad 35 cm alta, omnino cano lanata. *Folia* spatulata, 3.5–4 cm longa, 1.2–1.8 cm lata, apice subacuta vel rotundata, basi multo attenuata. *Pedunculi* ascendentes, 15–18 cm longi. *Corymbi* plani, 2–2.4 cm diam., infra dense araneosi. *Capitula* congesta, subcampanulata, 6 mm longa, 3.5–4 mm lata. *Receptaculum* conicum, nudum. *Flores* hermaphroditi, circiter 27. *Involucri bracteae* plerumque 3-seriatae, flavae, nitidae. *Corolla* pallide lutea. *Pappi setae* numerosae, plumosae. *Achaenia* breviter pubescentia.

NATAL.—Bergville District: frequent in alpine grassveld below Organ Pipes Pass, 9,200 feet, Cathedral Peak Forest Influences Research Station, Killick 1879 (PRE, type).

A decumbent to suberect herb up to 35 cm high, grey-lanate all over. *Leaves* spatulate, 3–5 cm long, 1.2–2.2 cm wide; apex subacute or round; base much attenuate appearing almost petiolate, somewhat stem-clasping. *Peduncles* ascending, up to 22 cm long, with single clasping lanceolate bract 2.2 cm long. *Corymbs* flat-topped, many-headed, 2–3 cm diam., densely araneous underneath. *Capitula* congested, subcampanulate, 6 mm long, 3.5–4 mm wide at summit. *Receptacle* conical, nude. *Florets* hermaphrodite, about 27. *Involucral bracts* usually 3-seriate, imbricate, not radiating, straw-coloured, glossy; outer linear or lanceolate, 4–5 mm long, embedded in wool; median lanceolate to spatulate, 5 mm long, 1.2–1.5 mm wide; inner similar to median. *Corolla* pale yellow; tube narrowly cylindrical, 4 mm long, widening slightly in upper third then abruptly at summit; lobes deltoid, 0.5 mm long, 0.3 mm wide at base; anthers with appendage at apex and acuminate tails at base; style branches truncate. *Pappus* of numerous plumose bristles with the trichomes progressively shorter towards the base. *Achenes* 5-ribbed, minutely pubescent.

H. drakensbergense is a very distinct species without any obviously close ally, consequently its position in the genus is difficult to establish. When one uses Harvey's key in *Flora Capensis* it runs to the section *Stoechadina*, but its relationship to the constituent species of that section is obscure.

It is surprising that this quite conspicuous plant has not been recorded before. It grows in alpine grassveld below the Organ Pipes Pass next to a footpath which is frequently used by climbers making for Cleft Peak or Basutoland and is a socially growing species forming fairly large communities.

***Senecio cryptolanatus* Killick, sp. nov., affinis *S. tugelensi* Wood et Evans, sed plantis acaulescentibus differt.**

Herba acaulescens, ad 8 cm alta, rhizomate lanato robusto. *Folia* rosulata, spatulata, 5–7 cm longa, 1–1.4 cm lata, apice subacuta vel obtusa, plus minusve carnosae, glabra, nervis immersis, marginibus integris rubris, in axillis lanata. *Pedunculi* simplices, 17 cm longi, bracteis 8. *Capitula* solitaria, subcampanulata, 1 cm longa, 1.3–1.5 cm lata, calyculata. *Involucri bracteae* circiter 20, lineari-lanceolatae, 7–8 mm longae, 1.5 mm latae. *Receptaculum* alveolatum. *Flores radii* circiter 17, lutei. *Flores disci* numerosi. *Pappi setae* numerosae, barbellatae. *Achenia* glabra.

CAPE.—Barkly East District: Doodman's Krans Mountain, Drakensberg, 8,900 feet, Galpin 6723 (in part).

NATAL.—Bergville District: top of Mont aux Sources, 11,000 feet, Evans 743 (in part); mountain top, 11,000 feet, Mont aux Sources, Allsopp 24; very rare on streambank on summit of Drakensberg between Indumeni Dome and Cleft Peak, 9,700 feet, Killick 1941 (PRE, type).

NOTE.—Evans 743 and Galpin 6723 in the National Herbarium are mixtures consisting of *Senecio cryptolanatus* and *S. tugelensis*. Mr. W. Marais, our liaison officer at Kew, reports that Evans 743 in Herb. Kew. has the same mixture, but that Galpin 6723 is *S. tugelensis* only. He also reports that Milford 636 and Galpin 6722 are *S. cryptolanatus*.

An acaulescent herb up to 8 cm high with a thick and woolly rootstock. *Leaves* rosulate, spatulate, occasionally oblanceolate, 3–8 cm long, 0.5–1.7 cm wide, apex subacute to obtuse, somewhat fleshy, glabrous, veins immersed, margins red, usually entire but sometimes distantly serrate, axils with long tufts of white wool. *Peduncles* simple, rarely divided into two; bracts 5–10, lanceolate with a subrotund base, white wool in axils. *Heads* solitary, subcampanulate, 1 cm long, 1.3–1.5 cm wide, calyced. *Involucral bracts* about 20, linear-lanceolate, 7–8 mm long, 1.5 mm wide, with acuminate apices. *Receptacle* honeycombed. *Ray florets* about 17, yellow. *Disc florets* numerous. *Pappus* of numerous barbellate bristles. *Achenes* glabrous.

Senecio cryptolanatus is a distinct species with yellowish green, somewhat fleshy, rosulate leaves. The plants seen by the author had red-margined leaves, a character which is not always evident in the dried material. All the collectors describe the flowers as yellow, but in the dried state the rays are almost white on the inner face and yellow on the outer. The plant flowers during March and April. The epithet *cryptolanatus* refers to the "hidden" tufts of wool in the axils of the leaves, bracts and involucral bracts.

This species grows on the summit of the Drakensberg Mountains between 8,900 and 11,000 feet usually at the edge of small streams or pools. Its known distribution is from Doodman's Krans Mountain in the Barkly East District of the Eastern Cape to Mont aux Sources in Natal—a range of some 200 miles. *S. cryptolanatus* was first collected in March, 1898, by Maurice Evans, one of the earliest collectors in the Drakensberg area.

S. cryptolanatus has no very close ally, but is probably nearest *S. tugelensis* Wood and Evans, which differs in being caulescent. It is rather surprising that *S. cryptolanatus* has been collected in mixed gatherings with *S. tugelensis*; morphologically the two species are easily distinguishable and in addition they have a different ecology. *S. cryptolanatus*, as already pointed out, is a streambank or pool-edge plant, whereas *S. tugelensis* grows in alpine grassveld.

***Senecio praeteritus* Killick, sp. nov., affinis *S. brevidentato* M. D. Henderson, sed foliis radicalibus cordato ovatis non oblanceolatis differt.**

Herba erecta, ad 40 cm alta, simplex, basi fibrosa. *Caules* glabri vel breviter pubescentes. *Folia* glabra; radicalia cordato ovata, laminis 1.2–2 cm diam. petiolis 2.5–3 cm longis, apice subacutis vel rotundatis, marginibus repando dentatis subreflexis; folia caulina inferiora oblanceolata vel spatulata, 2.5–5.5 cm longa, 0.8–1.8 cm lata, marginibus ut in foliis radicalibus; superiora lanceolata, 1.3–2.7 cm longa, 1–4 mm lata, basi auriculata amplexicaulia, obscure et sparse dentata. *Pedunculi* laxi corymbosi, rari simplices. *Capitula* radiata, calyculata, lutea. *Receptaculum* alveolatum. *Involucrum bractearum* circiter 20, lineares. *Flores* radii circiter 10. *Flores disci* numerosi. *Achaenia* juvenia glabra, tereta. *Pappi setae* numerosae, breviter barbellatae.

NATAL.—Bergville District: locally abundant, mountain side, Old Basuto Pass, National Park, 6,000 feet, *Galpin* 9739; locally frequent on streambank, Cathedral Peak Forest Influences Research Station, 6,800 feet, *Killick* 1796 (PRE, type).

Erect herb up to 40 cm high with a fibrous base. *Stems* simple, usually glabrous but sometimes minutely pubescent. *Leaves* glabrous, distinctly paler on the lower surface; radical cordate-ovate with the blade 1–2 cm diam. and petiole 1.5–3 cm long, apex subacute to round, margins repand dentate occasionally appearing crenate, subreflexed, teeth thickened; lower cauline oblanceolate to spatulate, 2.5–5.5 cm long, 0.4–1.8 cm wide, margins as in the radical leaves; upper cauline lanceolate, 1.3–2.7 cm long, 1–4 mm wide, auriculate and somewhat amplexicaul at the base, obscurely and distantly toothed. *Peduncles* laxly corymbose, rarely simple, with 1 or 2 linear bracts 2–6 mm long. *Heads* radiate, subcampanulate, 6–9 mm long, 6–8 mm wide at the summit, yellow, calyced. *Receptacle* honeycombed, angles of pits produced into subulate processes. *Involucral bracts* about 20, linear, 5–6 mm long, margins membranous, apex black-tipped, glabrous. *Ray florets* usually 10; tube 4–5 mm long, limb twice as long. *Disc florets* numerous, 7 mm long, widening above middle; lobes narrowly triangular, 1 mm long, 0.75 mm wide at base; style branches truncate, conspicuously hispid at tips; filaments thickened below anthers; anthers with incurved apical appendage. *Achenes* terete, glabrous. *Pappus* of numerous barbellate bristles.

This new species of *Senecio* was first collected in November, 1928, by E. E. Galpin. He found it growing at the side of the Old Basuto Pass in the Mont aux Sources area of the Drakensberg. Galpin describes the plant as “locally abundant”. Twenty-four years elapsed before it was collected again, hence the epithet *praeteritus* meaning “passed-over”. The author found the plant growing on a streambank in the upper reaches of the Indumeni Valley on the Little Berg in the Cathedral Peak area. There it is locally frequent.

The affinity of *S. praeteritus* seems to be with *S. brevidentatus* M. D. Henderson, which differs in having oblanceolate instead of cordate-ovate radical leaves.

A note by Dr. E. P. Phillips on the Galpin specimen states that the plant is “near *Senecio cordifolius* Linn. f.” At first sight this seems possible; *S. cordifolius*, a S. W. Cape species, has the same three leaf shapes. However, this is another example of homoplastic similarity between unrelated species—in this case between two species of different genera for, as pointed out by Spencer Moore in Journ. Bot. 41, 406 (1903), L’Heritier in Sert. Angl. 25 transferred *S. cordifolius* to *Cineraria* renaming it *C. mitellaefolia*. In *C. mitellaefolia* the achenes are compressed as is characteristic of *Cineraria*, whereas in *Senecio praeteritus* the achenes are clearly terete.

CONVOLVULACEAE.

Ipomoea bisavium A. Meeuse sp. nov., *I. heterosepalae* Baker affinis sed pedunculis longioribus praecipue differt.

Perennis, alte scandens. *Caules* lignosi teretes, ad ca 1 cm diam. cortice atro-brunneo vel nigricanti rugoso obtecti, juveniles graciles adpresse puberuli. *Folia* firmiter herbacea in siccitate chartacea, ovato-cordata vel elongato-cordata, integra vel subcrenata, acuminata vel attenuata, mucronata basi late cordata vel subcordata, 3–7 cm longa 1.5–5 cm lata lobis basalibus rotundatis; lamina utrinque praecipue subtus minute adpresse pubescenti, glabrescenti costa et nervis secundariis gracilibus subtus paucè prominentibus petiolis gracilibus subteretibus dense adpresse puberulis 1–3 cm longis. *Inflorescentiae* axillares, pauciflorae, monochasiales vel interdum flores solitarii; pedunculus communis satis gracilis, teres, dense adpresse puberulus, ad 7 cm longus pedunculis secundariis ad 3 cm longis pedicellis gracilibus minute pubescentibus substriatis 0.5–2.5 cm longis; bracteolae submembranaceae ovato-lanceolatae vel oblongae, acutae, sparse puberulae, subciliatae, ca 6 mm longae 2–3 mm latae, deciduae. *Sepala* erecta, in vivo dilute virides in siccitate olivacea, extus pubescentia demum glabrescentia, inaequalia; 2 exteriora cordato-triangularia lobis basalibus biauriculatis, subacuminata, subobtusata, margine plus minusve undulata, ca. 14 mm longa 8–9 mm lata; sepalum tertium semicordatum-subfalcatum, 10–11 mm longum 4–5 mm latum, 2 interiora minora, vix auriculata, oblonga-lanceolata, subacuta, 9–10 mm longa 2–3.5 mm lata. *Corolla* infundibularis, alba tubo ad basin intus violaceo; tubus ca 2 cm longus, limbus 4–6 cm diam., vix lobatus, 5-angulatus, patens cum 5 fasciis mesopetalis extus pilis albidis strigoso-pilosis. *Stamina* inaequalia, ad basim breve glanduloso-pilosa granulis pollinis spinulosis. *Pistillum* glabrum. *Capsula* ovoideo-conoidea, glabra, fusca, 10–12 mm longa, ca 8 mm diam. *Semina* plerumque 4, ca 4.5 mm longa, velutina et ad angulos cum linea pilorum longissimorum fulvidorum ca 7 mm longorum.

TRANSVAAL.—Zoutpansberg district: about 2 m. S. of Wyllie's Poort, *Meeuse* 10181 (flow. 2/4/1957, PRE, type); *Meeuse* 10237 (fruit 11/5/1957), isotypes in BM, BR, EA, K, L, SRGH.

A tall perennial climber, reaching the tops of the supporting trees. *Stems* woody, terete, attaining a thickness of about 1 cm near the base, in the older parts covered with a dark brown to blackish rough bark, the youngest twigs firmly herbaceous to wiry, green, adpressed-puberulous. *Leaves* firmly herbaceous drying chartaceous, ovate-cordate to elongate-cordate, entire or faintly crenate, acuminate to attenuate and mucronate at the apex, broadly and shallowly cordate to subtruncate at the base, with rounded basal lobes, on both surfaces, especially on the lower one, minutely adpressed-puberulous mainly on the nerves, more or less glabrescent; the midrib and the subparallelly arranged main nerves slender, slightly prominent beneath; the blade 3–7 cm long and 1.5–5 cm wide, the petiole slender, subterete, densely adpressed-puberulous, 1–3 cm long. *Inflorescence* axillary, cymosely few-flowered or occasionally reduced to a single flower; common peduncle rather slender, terete, densely adpressed-puberulous, up to 7 cm long; secondary peduncles of the monochasia resembling the common peduncles but slightly thinner, up to 3 cm long; pedicels slender, minutely pubescent, somewhat striate, 0.5–2.5 cm long; bracteoles submembranous, ovate-lanceolate or oblong, acute, sparsely puberulous and subciliate, about 6 mm long and 2–3 mm wide, early deciduous. *Sepals* erect, unequal, light green drying olive-green, finely pubescent outside, glabrescent, not or hardly accrescent in fruit; two outer sepals cordate-triangular, biauriculate by the basal lobes of the cordate base, subacuminata, subobtusata at the very apex, more or less undulate along the margin, about 14 mm long and 8–9 mm wide near the base; third sepal somewhat asymmetrical, semi-cordate-subfalcate, 10–11 mm long and 4–5 mm wide; the innermost two distinctly smaller, not or hardly auriculate at the base, oblong-lanceolate, subacuta, 9–10 mm long and 2–4.5 mm wide. *Corolla*

funnel-shaped, white with the lower portion of the tube purple-mauve inside; the tube glabrous, about 2 cm long, the limb spreading; hardly lobed, 5-angled, 4-6 cm in diam; the midpetaline areas strigose-pilose with white hairs on the outside. *Stamens* unequal, white, at the base shortly glandular-pilose; pollen grains spinulose. *Pistil* glabrous. *Capsule* ovoid-conical, glabrous, brown when ripe, 10-12 mm long and about 8 mm in diam. *Seeds* normally 4, about 4.5 mm long, shortly velutinous with greyish or drab hairs and in addition bearing fulvous hairs 7 mm long on the angles.

This plant was discovered after the manuscript of a revision of the South African Convolvulaceae had gone to press. Specimens were sent to the herbaria in Brussels, Kew, Nairobi and Salisbury, where Professor W. Robyns, Mr. W. Marais, Dr. B. Verdcourt and Dr. H. Wild all failed to match it. Mr. Marais, who also tried to match it in the British Museum (Nat. Hist.) herbarium, and Dr. Verdcourt reported that its nearest relationship is obviously with *Impomoea heterosepala*, a Somaliland species. Thanks are offered to all the botanists who so promptly answered my queries.

As the plant under discussion was collected in a place which was rather inaccessible until the opening of the new road to Wyllie's Poort, it is unlikely to be an introduction or a garden escape. The locality is on a dry rocky hillside northwest of the new road between the Punch Bowl and Wyllie's Poort, about two miles from the Poort. This locality was visited twice, in April, 1957, for flowering material, and again in May of the same year to collect the fruits. Only a single plant was seen, and the flowering and fruiting specimens are from the same individual. This species is named in honour of Dr. Allan V. Bird, M.D. of Johannesburg and his son Peter for their active assistance in the gathering of the specimens, which, in the dense thorn scrub of the type locality, was by no means a sinecure.

I. bisavium is closely related to *I. heterosepala* Baker, but according to the report received from Mr. Marais, differs in the following characters:—

	<i>I. heterosepala</i> .	<i>I. bisavium</i> .
Flowers.....	Almost invariably solitary	Inflorescence usually several-flowered.
Peduncles.....	1-1.5 cm long up to bracts and articulation.	Common peduncle 3-7 cm long.
Pedicels.....	1.5-2.5 cm long.	Up to 3 cm long.
Bracts.....	Small and narrow.	Elliptic, foliaceous.
Sepals.....	Ovate-cordate, acute.	Cordate, acute.

The seeds and apparently the colour of the corolla of *I. heterosepala* are unknown, but the differences indicated above, apart from the complete geographical separation, appear to be sufficient to warrant specific distinction.

Viable seeds were obtained which have germinated quite well and it is hoped that plants can be raised, so that this species can be figured for "Flowering Plants of Africa" in the near future.

A. D. J. MEEUSE.

CORRECTION.

"I wish to correct an erroneous statement which appeared in Dr. Meeuse's recent excellent account of the South African Convolvulaceae (Bothalia 6, 4: 1958). On reading through I noticed on page 753 the statement that the type of *Impomoea aquatica* Forsk. at Copenhagen is not in accordance with the usual conception of that species. This statement should have applied to *Ipomoea biloba* Forsk. and a note concerning this is to be published in the Kew Bulletin. This error is entirely due to a misleading statement in the postscript of a letter I sent to Dr. Meeuse and I must apologise to him and to his readers."

B. VERDCOURT.

EUPHORBIACEAE.

Euphorbia rowlandii R. A. Dyer, sp. nov., habitu acaule ramis 5-7-angulatis podariis corneis confluentibus cyma solitaria capsula plus minusve acute triangulata distinguitur.

Planta succulenta acaulis perennis armata, basi profunde ramosa ad 1.5 m alta. *Rami* suberecti simplices vel raro ramulosi, 5-7-angulati in segmentis 7-15 cm longis basin versus 3-5 cm latis superne angustioribus constricti, podariis corneis 2-aculeatis confluentibus, aculeis ad 1 cm longis. *Cyma* solitaria plus minusve 2-4 mm supra aculeos emittentia, breviter pedunculata, 3-cyatheis. *Cyathium* primum masculinum, cyathea lateralia 2, bisexualia; involucrum 4.5-5 mm diametro, glabrum, lobis parvis subquadratis fimbriatis et glandulis 5 transverse oblongis 2.5-3 mm latis contiguis integris flavis munitum. *Ovarium* breviter stipitatum; styli circiter 1.5 mm longi infra medium connati. *Capsula* circiter 9 mm lata plus minusve acute triangulata pedicello circiter 5 mm longo exserta.

PLATE II.

TRANSVAAL.—Soutpansberg District; on rocky outcrop eight miles north of Punda Maria in Kruger National Park, *Rowland Jones* 48 in National Herbarium, Pretoria, No. 28636 (PRE, type); 48A in PRE No. 28637; *Codd* 5370.

A succulent shrub 1-2 m tall and about the same width, with a suppressed main trunk rising only very shortly above ground and producing many spreading-erect branches. *Branches* 5-7-angled, very rarely rebranched, constricted into segments 7-15 cm long; segments 3-5 cm broad near their base and narrowed gradually upwards to the base of the segment above, with the constriction about 2 cm broad; angles acute, winglike, with a narrow continuous horny margin, paired spines and rudimentary leaves. *Spines* in pairs about 1 cm apart, 5-10 cm long without prickles or with only rudimentary ones on either side of the leaf-base or scar. *Cymes* solitary, 2-4 mm above the spines, shortly pedunculate, consisting of 1 central male cyathium and 2 lateral bisexual cyathia arranged in a plane parallel to the main axis; peduncle about 2 mm long and about as thick, bibracteate; involucre cup-shaped, glabrous, about 4.5-5 mm diam. with 5 glands and 5 small subquadrate, fimbriate lobes; glands contiguous, transversely oblong, 2.5-3 mm in their greater width, nearly flat on upper surface, yellow. *Ovary* on a short gynophore about 1 mm long with a small rim-like calyx; styles about 1.5 mm long, united below the middle, with free portions about 1 mm long, spreading, bifid at tips; ovule attached within a hood, filling the cell; capsule purple, more or less acutely 3-lobed, about 9 mm broad, seed globose, about 2.5 mm diam.

The first recorded specimen of the species was collected by Dr. L. E. Codd in 1949 when he visited Lt. Col. Rowland Jones, then in charge of the northern sector of the Kruger National Park with headquarters at Punda Maria. Lt. Col. Rowland Jones subsequently forwarded both flowering and fruiting material. It is now nearly 10 years since the plants were recorded by the two collectors as rare on the sand stone ridges 8-9½ miles north-west of Punda Maria and although a constant search has been maintained no further records have been made.

Several miles distant from the site of *E. rowlandii* occurs *E. confinalis* R. A. Dyer which undoubtedly is a fairly near relative in spite of the fact that it grows into a tree of about 25 ft. tall, generally has fewer angles to the branches and shows significant differences in the inflorescence. There is a close superficial resemblance to *E. waterbergensis* R. A. Dyer, which however, has more slender, parallel-angled branches and differs in details of the inflorescence.

The combination of characters to be given taxonomic importance are the trunkless habit, the segmented branches with 5-7 angles, the continuous horny margin to the angles, the shortly pedunculate solitary cymes with 3 cyathia developed in a plane parallel to the main axis and the relatively deeply 3-lobed capsule.

R. A. DYER.

Euphorbia cussonioides Bally, sp. nov., affinis *E. obovalifoliae* A. Rich., sed foliis rotundioribus, ramulis brevioribus, angustioribus, ad ramorum cacumina congestis, ovarii denique calyci sine processis distinguenda.

Arbor 20-25 m alta, succulenta, spinosa, trunco erecto, cylindrico, ad 12 m alto, 80 cm diametro, ramis primariis paucis, spiraliter dispositis, ascendentibus, teretibus, rare ramificis, ramulis numerosis ad cacumina coronatis. *Ramuli* usque 75 cm longi, segmentati, inter segmenta constricti, ramifici, 3- raro 4-angulati, angulis valde compressis, 2-3.5 cm latis, margine undulato vel obtuse dentato. *Podarii* in apicibus dentium dispositi, cornei, brunneogrisei, breviter triangulati, 5 mm longi, aculeis binis ad 1.5 mm longis, saepe obsoletis instructi. *Folia* sessilia, in transversum subrotunda, ad 9.5 mm longa, ad 10 mm lata, succulenta, mox decidua. *Cymae* 1-4, ex podario uno, 1-2 mm supra aculeos productae, perbreviter pedunculatae, 3 cythia gereantes. *Pedunculum* bibracteatum. *Bractee* late deltoideae vel late oblongo-ovatae, membranaceae, margine denticulato, 3 mm latae, 2.3 mm longae. *Cyathium* primum masculinum, deciduum. *Cyathium* bisexuale 6.5 mm diametro, in forma poculi, 5 glandulis flavoviridibus, in transversum reniformibus, 3.4 mm latis, 1.3 mm longis, margine integro, leviter incrassato, 5 lobis subquadratis, fimbriatis munitum. *Capsula* breviter exserta, erecta, glabra, profunde trilobata, 10-12 mm longa, 14-15 mm diametro. *Calyx* obtuse trilobatus, lobis breviter dentatis munitus. *Styli* usque basim divisi, erecti, ad 1.2 mm longi, apice bifidi. *Semen* subglobosum, 4 mm longum, 3.5 mm diametro, griseomaculatum.

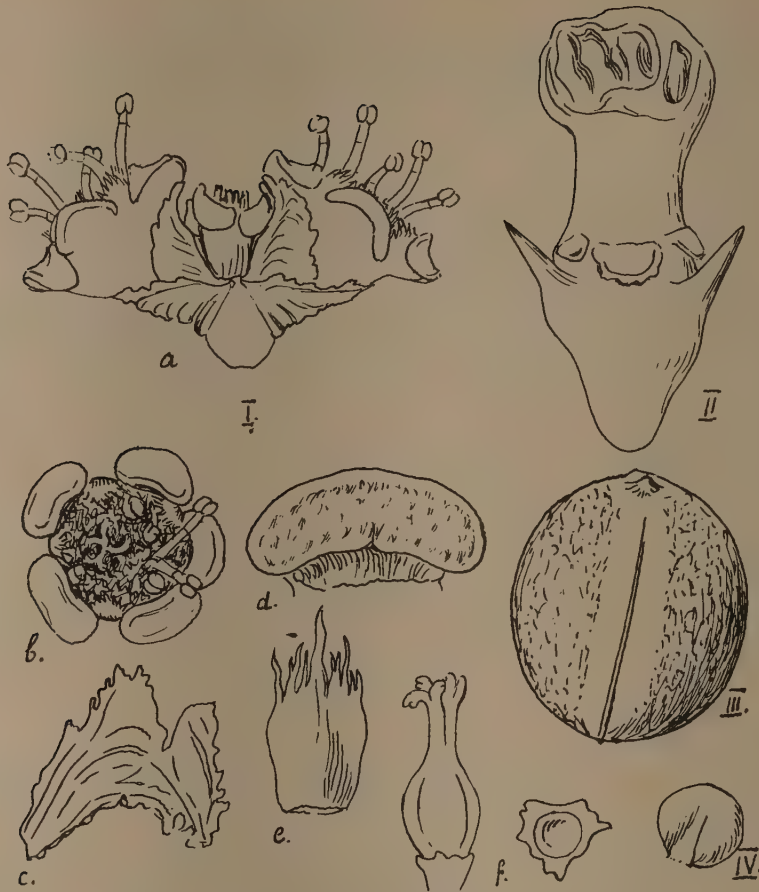
PLATE III.

KENYA COLONY.—Southern Prov.; Ngong Dist., at Ngong, *McDonald* (Bally E 42) 8/1/39 (EA, type) (EA, type); Central Prov.: Fort Hall Distr., Meru-Sagana, *Jackson* (Bally E 171); Ndarugu, *Bally*; Thika, *Bally*; Gorge of Chania River, *Piers*. Embu Distr., *Bally*, (Phot. CVI, 36).

With a height up to 25 metres this species is one of the tallest and most imposing of the tree Euphorbias. Its comparatively late discovery in 1939, hardly twelve miles from Nairobi, is partly due to its habitat, tall mixed Highland Forest in which its lofty crown merges with the closed canopy, and partly to its general appearance. The crown of *E. cussonioides* consists of comparatively few ascending branches, crowned by clusters of short, thinly winged branchlets which, at a distance, resemble foliage; its general appearance is not unlike that of *Cussonia holstii*, which is expressed in the name of the new species. The type of forest in which *E. cussonioides* occurs comes under the category of "Mixed Highland Forest" which, in the neighbourhood of Nairobi, consists mainly of *Brachylaena hutchinsii*, *Croton macrostachys*, *C. megalocarpus*, *Calodendrum capense*, *Cussonia holstii*, *Olea chrysophylla*, *Strychnos* spp. *Teclea* spp., *Warburgia ugandensis*.

The range of distribution of *Euphorbia cussonioides*, as it is known at present, is restricted to the Kenya Highlands at altitudes between 4,500 ft. and 6,000 ft., where it occurs in a belt extending from the foot of the Ngong Hills just South of Nairobi north-east wards for about 90 miles as far as Embu, on the southern slopes of Mr. Kenya where the annual rainfall is between 34 and 60 inches. In spite of its fleshy branches and its small deciduous leaves this species is not a xerophyte.

The Kikuyu-name is "kithuri"; in Embu the tree is known as "mramba".

FIG. 1.—*Euphorbia cussonioides* Bally.

I.	a: cyme.....	1 × 4
	b: bisexual involucre.....	1 × 4
	c: bract.....	1 × 4
	d: gland.....	1 × 10
	e: lobe.....	1 × 10
II.	spine-shield.....	1 × 10
III.	seed.....	1 × 10
IV.	leaf.....	1 × 1

The timber is very soft, white and even-grained and should be well suited for the manufacture of matches. The copious latex is white. It hardens when drying to a guttapercha-like consistency.

A tree, 20–25 m high, fleshy, spiny, with an erect, cylindrical bole to 12 m high and to 80 cm diam. Branches few, spirally disposed, ascending, terete, sparsely branched, bearing at their tips numerous 3–4-angled, fleshy, green branchlets, branchlets up to

75 cm long, segmented, with constrictions between the segments; the segments up to 20 cm long, branching from the constrictions, 3- or rarely 4-angled, with angles much compressed, 2-3.5 cm wide, their margins undulate or obtusely dentate. *Spine-shields* disposed at the apex of the teeth, grey-brown, shortly triangular, 5 mm long, with a pair of thin spines up to 1.5 mm long, sometimes obsolete. *Leaves* sessile, transversely subrotund up to 9.5 mm long, 10 mm wide but mostly smaller, fleshy, soon deciduous. *Cymes* produced from the spine-shield, 1.2 mm above the spine-pair, one to four, very shortly pedunculate, bearing one central and two lateral cyathia each. *Peduncle* fleshy, with two lateral bracts. *Bracts* broadly deltoid, or obovate-oblong, membranous, 2.3 mm long, 3 mm wide, with a denticulate margin; central cyathium male, soon deciduous, lateral cyathia bisexual, 6.5 mm diam., cupshaped, bearing 5 not contiguous, reniform, greenish-yellow glands with entire, slightly thickened, raised margin, and with 5 subquadrate, fimbriate lobes. *Capsule* shortly exserted, erect, glabrous, deeply 3-lobed, 10-12 mm long, 14-15 mm diam. *Calyx* obtusely 3-lobed; its lobes shortly and irregularly dentate. *Styles* divided to the base, fleshy, erect, 1.2 mm long, with bifid apex. *Seeds* subglobose 4 mm long, 3.5 mm diam., grey with darker brown-grey spots.

P. R. O. BALLY.

RHAMNACEAE.

Ziziphus rivularis L. E. Codd, sp. nov., *Z. pubescenti* Oliv. affinis, sed cymis sessilibus ovariis trilocularibus stylis 3 foliis glabrescentibus differt.

Frutex vel arbuscula ad 7 m altus inermis; ramuli cano-tomentosi. *Folia* petiolata lanceolata vel ovato-lanceolata serrulata glabrescentia, basi rotundata obliqua, apice acuta; petiolus 4-10 mm longus; lamina 3.5-6.5 cm longa, 1.2-3.4 cm lata. *Stipulae* minutae. *Cymae* axillares sessiles, floribus 1-5; pedicelli 1-1.5 mm, deinde frugibus maturatis 2.5-3 mm longi. *Calyx* 5-lobatus coriaceus, externe pubescens; lobi trianguli, 1.5 mm longi, apicem versus crassiores. *Corolla* minuta; petala 5, obovata unguiculata. *Stamina* 5, petalis opposita. *Orbis* carnosus, obscure 5-lobatus. *Ovarium* in orbe depressum, cellulis 3; ovula solitaria; styli 3, subulati. *Fructus* drupa globosus indehiscens, diametro 6-7 mm.

TRANSVAAL.—Soutpansberg: south end of Wyllie's Poort, *Gerstner* 6011; 6037; *Codd* 3009; 4823; 8348; Kruger National Park, Baiandbai, *Lang* in TM 32131; Shingwedzi River, *Lamont* 26; Pongola River, *van der Schijff* 3819. Nelspruit: Kruger National Park, beside stream in Lebombo Mountains, Crocodile Bridge Division, *van der Schijff* 3974 (PRE, type). Barberton: 6 miles south of Komatipoort, on banks of Komati River, *Codd* 7777.

MOCAMBIQUE.—Goba, *Hörnby* 712; Umbeluzi, *Torre* 6503.

Shrub or small tree up to 7 m high, unarmed; bark grey, smooth; branchlets and innovations covered with a short, greyish tomentum. *Leaves* alternate, petiolate, lanceolate to ovate-lanceolate, serrulate, apex acute, base rounded, often oblique, from which three main nerves arise, sparingly pubescent on the nerves below and along the margin, becoming glabrous with age; petiole 4-10 mm long; blade 3.5-6.5 cm long and 1.2-3.4 cm broad. *Stipules* minute. *Inflorescence* an axillary, sessile cyme, consisting of 3-5 (rarely 1 or 2) shortly pedicellate flowers; pedicels 1-1.5 mm, elongating to 2.5-3 mm in the fruiting stage. *Calyx* 5-lobed, coriaceous, pubescent without; lobes triangular, 1.5 mm long with a thickened keel towards the apex within. *Corolla* minute; petals 5, obovate, clawed, truncate at the apex, attached between the calyx lobes. *Stamens* 5, opposite the petals; filaments 1 mm long; anthers 2-celled, medifixed. *Disc* fleshy, obscurely 5-lobed. *Ovary* superior, embedded in the disc, 3-celled; ovules solitary, erect; styles 3, free above the disc, subulate; stigma scarcely differentiated. *Fruit* globose, drupaceous, indehiscent, usually solitary in the leaf axil, 6-7 mm in diameter, dark brown when ripe, shortly pedicellate; endocarp and septa relatively thin, semi-woody; seeds usually 3 (rarely 1 or 2), compressed.

Material of this species has been accumulating at the National Herbarium for some years. Specimens were sent to Kew Herbarium and were reported to be unmatched in any species represented there. An attempt to name it in Suessenguth's treatment of the Rhamnaceae, Pflanzenfam. 20d (1953), was unsuccessful. It is unique among South African members of the genus in being unarmed and in having a 3-celled ovary with 3 styles, and a fruit in which the endocarp and septa between the cells do not develop into a hard, stony centre. Nevertheless, these are not characters which would exclude it from the genus *Ziziphus*.



FIG. 2.—*Ziziphus rivularis* L. E. Codd (van der Schijff 3974). 1, fruiting twig, natural size; 2, transverse section through fruit, $\times 3$; 3, flowering twig, $\times 10$; 4, flower, $\times 10$; 5, section through flower, $\times 10$.

In vegetative characters it shows a close resemblance to *Z. pubescens* Oliv., but there are important floral differences. The main distinguishing features are summarised below:—

	<i>Z. pubescens.</i>	<i>Z. rivularis.</i>
Leaves.....	Persistently tomentose.	Glabrescent.
Cymes.....	Shortly pedunculate, several-flowered.	Sessile, 1- to 5-flowered.
Ovary.....	2-celled.	3-celled.
Styles.....	2.	3.
Fruit.....	Ovoid, apiculate.	Globose.
Endocarp and septa.....	Thick and woody.	— Relatively thin, semi-woody.

Z. rivularis has so far been recorded only from the northern and eastern Transvaal and from the neighbouring region of Mocambique. Most collectors record that it is found on stream banks or in water courses, often among rocks, and this ecological character has suggested the specific name.

It may be noted that Suessenguth, l.c. (1953) cites the genus as *Zizyphus* Mill., Gard. Dict. Abridg. Ed. 4 (1754) and refers to a discussion on the spelling of the generic name by Loew in Flora der Juden, 3: 139 (1924). This work has not been consulted, but the main facts appear to be as follows: The species *Z. jujuba* Mill. was known in ancient times as “zizyphon” (Greek), “zizyphus” (Latin) and “Zizuf” (Arabic). It was listed by Dodonaeus (1616) as *Zizyphus* and by Linnaeus, Sp. Pl. Ed. 1: (1753), as *Rhamnus zizyphus*. However, Tournefort, Inst. Rei Herb. Ed. 3: 627, t. 403 (1719), although he cites Dodonaeus, spells the generic name as *Ziziphus* and Miller, basing his genus on Tournefort’s reference, adopted this spelling consistently in his fourth and subsequent editions. Even if it is argued that this is a philological error, it was deliberately used by Miller and would appear to be the spelling that must be taken up according to the rules.

L. E. CODD.

SELAGINACEAE.

Dischisma struthioloides Killick, sp. nov., affine *D. squarroso* Schlechter, sed foliis angustioribus acutioribus differt.

Fruticulus multo ramosus, erectus, 30–60 cm altus, ramis divaricatis, partim albanatis, dense foliatis. *Folia* subreflexa, sessilia, anguste triangula, 3–5 mm longa, basi 1–1.5 mm lata, integra, utrinque glabra, plus minusve glauca. *Spicae* terminales, cylindratae, 1–3 cm longae; bractae foliis similes sed basi 2.5 mm latae et dimidio inferiore ciliatae. *Calycis segmenta* 2, libera, navicularia, 4 mm longa, 0.7 mm lata, ciliata. *Corolla* alba, tubo gracili, antice ad infra medium fisso, 1.1 cm longo, lobis 4, subaequalibus, oblongis, 2.5 mm longis, 1 mm latis, lobo quinto rudimentario, 0.8 mm longo, subulato. *Stamina* 4, superiora 1.5 mm longa, inferiora 0.5 mm longa, antheris 1.5 mm longis, medifixis. *Ovarium* 1 mm longum; stylus 3 mm longus, stigmatibus simplicibus, 2.5 mm longo.

CAPE PROVINCE.—Namaqualand: 11 miles east by south of Hondeklip Bay, Strandveld on dunes, c. 500 feet, *Acocks* 14941 (PRE, type); Hondeklip, *Pillans* 163.

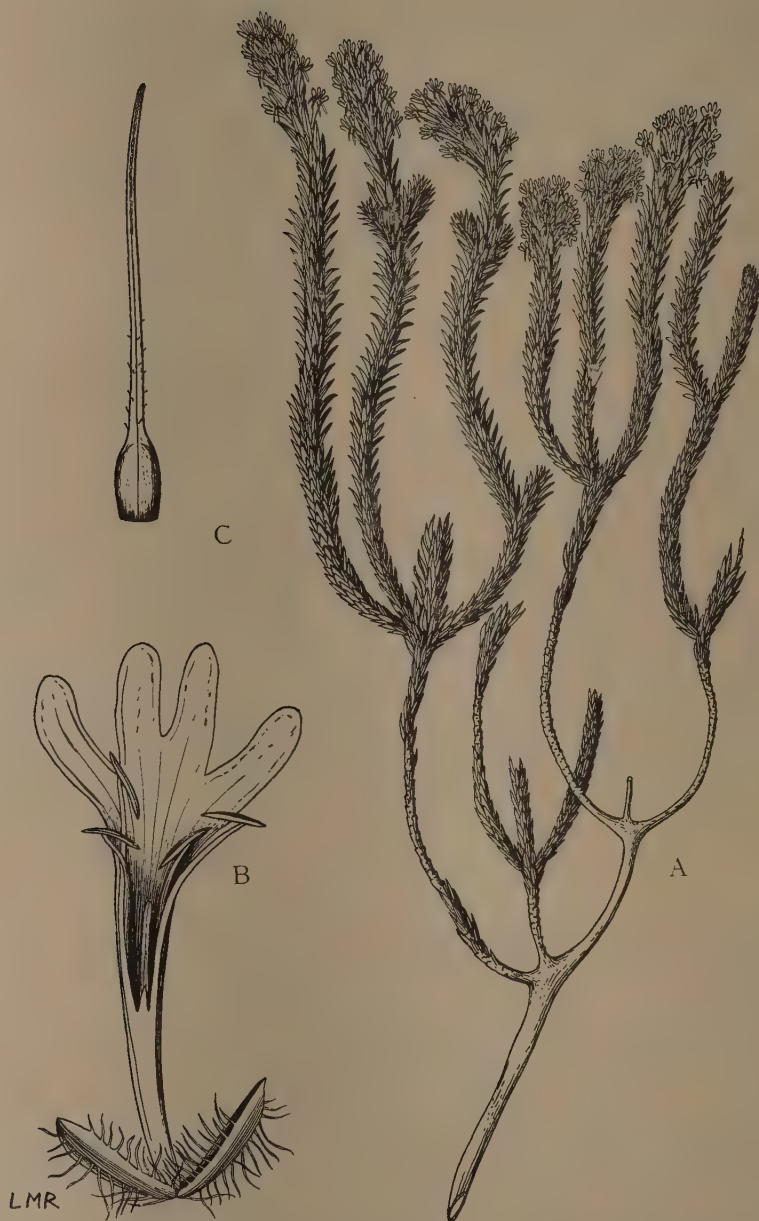


FIG. 3.—*Dischisma struthioloides* Killick : A, habit, $\times 1$; B, flower, $\times 10$; C, pistil, $\times 20$.

An erect, much-branched shrublet, 30–60 cm high. *Branches* divaricate, white-lanate in parts, densely foliate, older portions covered with persistent leaf-bases. *Leaves* slightly reflexed, sessile, narrowly triangular, 3–8 mm long, 1–2 mm wide at the base, glabrous, somewhat glaucous. *Spikes* terminal, cylindrical, 1–3.5 cm long; bracts similar to the leaves but 2.5 mm wide, almost ovate and ciliate in the lower half. *Calyx segments* 2, free, boat-shaped, acute, 4 mm long, 0.7 mm wide, ciliate. *Corolla* white; tube slender, 1.1 cm long, slit to just below half-way, lobes 4, subequal, oblong, 3 mm long, 1 mm wide, vestigial fifth lobe at base of slit, 1 mm long, subulate. *Stamens* 4, didynamous, upper 1.5 mm long, lower 0.5 mm long; anthers 1.5 mm long, medifixed. *Ovary* 0.5–1 mm long; style 3 mm long, with few scattered glands; stigma 2.5–3 mm long.

This new species of *Dischisma* from Namaqualand appears to have been collected only twice; first by Mr. N. S. Pillans in 1924 and then by Mr. J. P. H. Acocks in 1948. The specific epithet *struthioloides* points to the superficial similarity of this plant to species of *Struthiola* in Thymelaeaceae. So marked is this similarity that the Acocks specimen was originally misidentified as a *Struthiola*. The nearest ally of *D. struthioloides* is *D. squarrosus* Schlechter which, however, has broader and blunter leaves.

D. J. B. KILLICK.

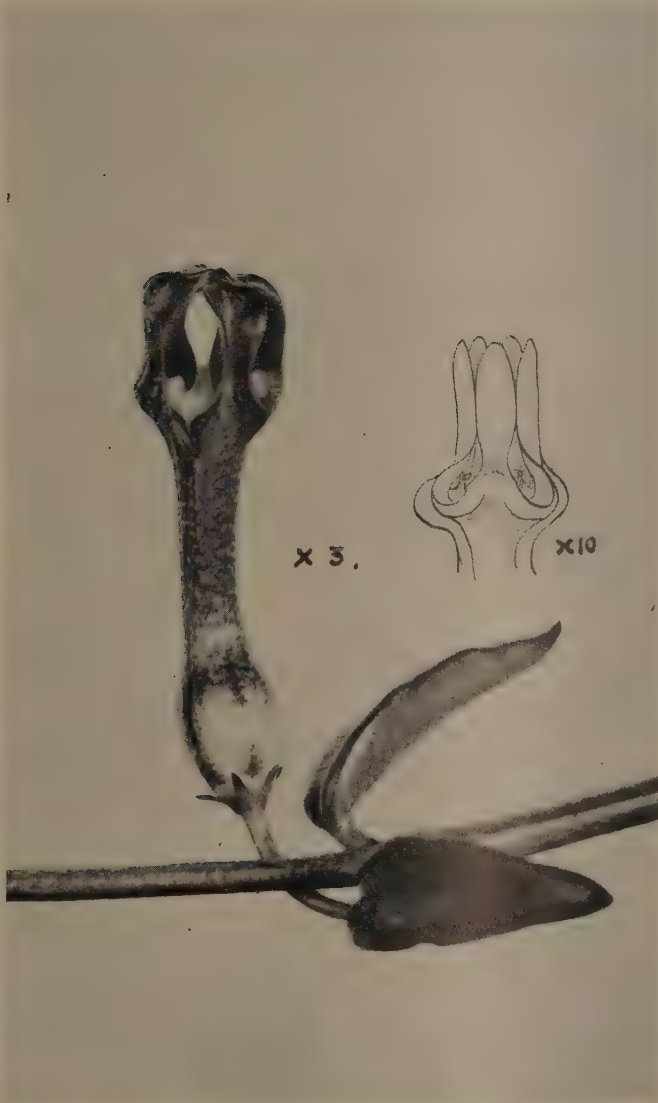


PLATE I.—*Ceropegia occulta* R. A. Dyer.



PLATE II.—*Euphorbia rowlandii* R. A. Dyer.



PLATE III.—*Euphorbia cussonioides* Bally.

The Protea Species of the Summer Rainfall Area of South Africa.*

By

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INTRODUCTORY.

The genus *Protea*, R. Br. (*nom. cons.*), is distributed throughout Africa south of the Sahara with two main centres of distribution, the Cape *fynbos* and the Central African *Brachystegia* belt which stretches from Angola through the Rhodesias into Tanganyika. The former contains about 70 species, and the latter, as at present known, about 50. Four species only which are not represented within the tropical *Brachystegia* belt occur to the north of it, bringing the total for tropics up to 54. For the summer-rainfall area of South Africa, which we may designate the sub-tropical belt linking the tropical and Cape centres of distribution, this paper will deal with 12 endemic species, bringing the total for the genus to 136. These are, therefore, equally divided between the Cape and the rest of Africa.

The summer rainfall area of South Africa is, for *Proteas*, essentially a transitional region and is thus in many ways of special interest. It is much poorer in species than the main centres to north and south which it links and the individual plants are less conspicuous in the landscape. Of the 15 species concerned, one (*P. lacticolor*) is essentially a Cape *fynbos* species which extends its range into the southern part of our area, and two (*P. gagedi* and *P. hirta*) are tropical species of very wide distribution which come down into Natal. The remaining 12 species are endemic to the summer-rainfall area. None of them enters Cape vegetation to the southward or tropical vegetation to the north. Two of them, *P. subvestita* and *P. roupelliae*, are of Cape affinity, belonging to sections of the genus (*Exsertae*, *Ligulatae*) otherwise only represented among Cape *fynbos* species. Nine others belong to the typically tropical sections *Lasiocephalae* and *Leiocephalae*, while three belong to a new section which it is proposed to recognize, the *Patentiflorae*, which also contains a number of tropical species.

TAXONOMY.

There have been only two complete treatments of the genus *Protea* in South Africa since R. Brown's work in 1810: Meisner in de Candolle's *Prodromus*, 1856, and Phillips and Stapf in the *Flora Capensis* Vol. V of 1913. The latter is therefore the foundation on which this paper rests. The taxonomy of *Protea* is in general very difficult and confused due to the horticultural popularity of the genus in Europe in the late eighteenth century and the consequent large amount of literature from that period. Fortunately for the present study, the summer-rainfall area *Proteas* were not discovered early enough to share in that confusion, and it is only one solitary intruder from the Cape flora, *P. lacticolor* Salisb., which is likely to present difficulty. It may be remarked that whoever sets out to revise the Cape *Proteas* will have to undertake some very laborious research into the eighteenth century work.

* (Preliminary account presented to the Annual Congress of the S.A. Association for the Advancement of Science, Nelspruit, 1956.)

Phillips and Stapf divided the South African species of *Protea* into 12 sections, arranged in two major groups; the first of these contained eight of the sections and consisted of arborescent plants, while the remaining four sections were placed in a group of suffrutescent plants having underground rootstocks. In the writer's opinion this major grouping is artificial and separates sections that should properly be united. We find the majority of summer rainfall species fall into the sections *Ligulatae*, *Exsertae*, *Lasiocephalae* and *Leiocephalae*, a treatment which it is proposed to follow. However, there are a number of dwarf species which would have to be placed among the *Microgeantheae* if Phillips and Stapf were followed literally: instead, they have been placed among the *Leiocephalae* where they clearly belong naturally. Furthermore, there are several others which may assume either a dwarf or arborescent habit according to growing conditions and degree of veld-burning.

Two of the newly discovered species described here, *P. comptonii* and *P. rubropilosa*, while closely related to one another, do not fit readily into any of the sections of Phillips and Stapf: their heads are much larger than in the *Lasiocephalae* and *Leiocephalae*, yet they are very distinctly different from any of the large-headed Cape sections. A curious feature, taken as diagnostic, is that the heads do not close again after anthesis while the fruit is maturing but remain wide open or *everted*, and the section is thus named *Patentiflorae*. Both heads and leaves are larger than in the *Lasiocephalae* and *Leiocephalae*, whose heads are uniformly closed after anthesis. The previously known species *P. curvata* is placed in this section, which will include also a number of the tropical species, notably *P. angolensis* Welw., *P. chionantha* Engl. and Gilg, *P. bella* Hauman and *P. madiensis* Oliv. The South African species are peculiar in that the growth-habit and bark of the trees and the leaves in the case of *P. rubropilosa* and *P. comptonii* are more typical of *Faurea* than of *Protea*, in particular resembling *Faurea galpinii*.

The treatment in this paper has perforce been based upon specimens in the South African herbaria, supported by a large amount of field study. The types of those species of more antique description are mostly in Europe, but they were obtained on loan for study for which thanks are due to the Directors of the herbaria at Kew, Berlin-Dahlem, Brussels and Leiden. Typification has been undertaken as prescribed in the international code. None of the authors of the species in question indicated holotypes. In cases where no duplicate specimens of the type have been traced the unicum has been designated the holotype. In other cases a lectotype has been selected, naming as far as possible a specimen which is at Kew or some other European herbarium.

DISTRIBUTION AND ECOLOGY.

In mapping the distribution of our species, use may be conveniently made of the vegetation map of the Union by Acocks, "Veld Types of S. Africa", which accompanies Botanical Survey Memoir No. 28.

The true Cape *fynbos* which is the real home of the Cape species of *Protea* is confined to the winter rainfall area west of Uniondale. The constant rainfall zone contains a *fynbos* mapped as "False Macchia" by Acocks which covers widely the various mountain ranges in the Uniondale, Humansdorp and Port Elizabeth Divisions and is prolonged in a narrow outlying strip along the Zuurbergen, around Grahamstown and at Riebeeck East. This False Macchia is much poorer in *Protea* species than the true Macchia further west and appears to contain only 19 of them. Fifteen of these do not range east of Uitenhage, the outlying area up to Grahamstown containing four species only.

North and east of this, across the Keiskama river and along the scarp front of the Winterberg and Amatola mountains, summer rainfall vegetation begins in the form of various types of grassveld which continue north right to the Limpopo. Here one can no longer expect to see *Proteas* more or less anywhere as is the case in the Cape *fynbos* . Habitats are now much more restricted and the *Proteas* occur in localised patches. Most of the summer rainfall area is covered with grassveld, which is a fire climax: much of this again is potentially forest, though whether it has ever actually in whole

or part been forest in recent geological times is another matter. The Proteas do seem to indicate that forest has at least been rather more extensive than it is today. They do not themselves occur, of course, in forest but they are found naturally in conjunction with it. In many places today where there are forests on mountain sides one can study this conjunction. At the foot of the slopes the forest is on deep soil and is very luxuriant; higher up the soil becomes more and more shallow and rocky, and the forest is reduced in stature. Eventually, if the mountain is capped by extremely steep and rugged slopes, rock slabs or krantzes, the forest gives way abruptly to an open Protea woodland. There is little doubt from the relics that occur in protected situations that this open Protea woodland as we now see it is a remnant, decimated by fire, of a Macchia floristically and physiognomically similar to the Cape *fynbos*. Acocks several times gives lists of associated Macchia species: various Ericaceae and Widdringtonia spp. were undoubtedly prominent but have been largely eliminated by fire. The Proteas are relatively fire-resistant and have survived. None the less there is a limit to their tolerance and all too many of the Protea colonies that one sees today are patently in a state of recession. The forest that they once bordered has long since disappeared, their associated shrubs have gone and now they themselves are threatened with extinction as the constant fires repeatedly eliminate their seedlings.

This ecological pattern is typical of the country along and to the east of the eastern escarpment, where we may only look for Proteas in the high rainfall areas and on sites too adverse for forest. In the central and western Transvaal the pattern changes into something much more suggestive of the tropics. Here, certain Protea species inhabit Acocks' Sour Bushveld and Bankenveld: in the former they are general and in the latter occur in the woodland which covers the rocky knolls, in both cases helping to make up a type of savanna woodland of distinctly tropical appearance. As before, however, we still find the Proteas occupying poor, rocky ground in the areas of highest rainfall.

As mentioned above, Acocks' Veld Types map has been drawn upon as an ecological basis for mapping Protea distribution, since the Protea species can be simply correlated with a small and defined number of veld types. The distribution of Proteas is not continuous, in fact it is highly erratic, and to map separately every single isolated locality of occurrence would be a formidable and rather unnecessary task. If, however, it is known in which veld types they are to be found, a map of the distribution of those veld types will divide the country within which locally Proteas may be found from that where they are absent. A "veld type" is not a plant community, it is really a landscape unit containing a mosaic of plant communities. Appropriate veld types contain Protea woodland as one of the components of the mosaic. Proteas occur in montane macchia in the following veld types:—

Acocks' Type 1, Coastal Forest and Scrub. 3, Pondoland Coastal Plateau Sourveld. 44, Highland Sourveld, with its unnumbered subdivision to the south, the Dohne Sourveld, and its separately numbered northern subdivision: 8, North-east Highland Sourveld. 45, Ngongoni veld of the Natal Mistbelt. 63, Piet Retief Sourveld (in part).

Proteas occur in savanna woodland in the following: 20, Sour Bushveld. 61, Bankenveld.

A small portion only of the Piet Retief Sourveld is affected, accompanying the escarpment of the Karroo rocks from Wakkerstroom north to the Swaziland border. It is probable that this strip should properly be regarded as a narrow extension of the Highland Sourveld.

With the exception of *Protea gaguedi* all our species occur within the boundaries of these veld types as mapped, unless here and there some mountain top carries a patch of the veld type too small to be separately mapped. *P. gaguedi* is typical rather of the ecotone between highland sourveld and bushveld and is thus frequently found slightly outside the borders of the above-mentioned veld types.

KEY TO SECTIONS.

1. Bracts exceeding or equalling the perianth..... 2.
Bracts very much shorter than the perianth..... 4.
2. Inner bracts spatulate, 2 mm wide in lower part, broadening to 10 mm wide at tip... I. *Ligulatae*.
Inner Bracts oblong..... 3.
3. Inner bracts pubescent, curved outwards away from the flowers: heads campanulate... II. *Exsertae*.
Inner bracts glabrous, curved inwards to enfold the flowers: heads globose or tur-
binate..... III. *Leiocephalae*.
4. Heads conical to globose, closing while the seed is ripening; perianth tube densely
shaggy-hairy..... IV. *Lasiocephalae*.
Heads everted and open while the seed is ripening; perianth tube glabrous or at most
lightly pubescent..... V. *Patentiflorae*.

ALTERNATIVE KEY TO SECTIONS.

Based on ratio total length of perianth to length of lip.

1. Ratio 2·5 or less: *Lasiocephalae*.
2. Ratio 2·5 to 3·0: *Ligulatae* or *Patentiflorae*.
Length of teeth 12 mm: *Ligulatae*.
Length of teeth 3–4 mm: *Patentiflorae*.
3. Ratio 3·0 to 3·5: *Leiocephalae*.
4. Ratio over 4: *Exsertae*.

KEY TO SPECIES.

Section I.—LIGULATAE. Heads large, 8–12 cm long, conical, inner bracts red, spatulate, silky-tomentose, exceeding the flowers.

Only species..... 1. *P. rouppelliae*.

Section II.—EXSERTAE. Heads medium-sized, 5–7·5 cm long, campanulate, inner bracts white or pink, silky-pubescent, recurved at tip, exceeding the perianths but not the styles.

Leaves hairy in youth, distinctly veined: Heads 6–7·5 cm long, perianth lip
14 mm..... 2. *P. lacticolor*.

Leaves woolly in youth, indistinctly veined: Heads 5 cm long, perianth lip 10 mm
..... 3. *P. subvestita*.

Section III.—LEIOCEPHALAE. Heads small to medium-sized, 4–8 cm long, globose or turbinate, bracts greenish tinged with red, glabrous, slightly incurved, more or less equalling the flowers.

1. Trees or divaricate shrubs: stems compound, flowering branchlets 5–15 mm
thick..... 2.

Low shrubs or small creeping plants: stems simple, flowering branchlets 3–5
mm thick..... 6.

2. Perianth 4 cm long, tube glabrous within..... 4. *P. caffra*.
Perianth 4·5–5 cm long, tube fulvously hairy within..... 3.

3. Leaves falcate and more than 15 cm long..... 6a. *P. rhodantha* var. *falcata*.
Leaves straight and under 15 cm long..... 4.

4. Most leaves less than 2·5 cm broad..... 5. *P. multibracteata*.
Most leaves more than 2·5 cm broad..... 5.

5. Leaves thin, venation prominent: heads 7–8 cm long.... 6. *P. rhodantha* var. *rhodantha*.
Leaves thick, venation indistinct: heads 5–6 cm long..... 7. *P. dracomontana*.

6. Leaves less than 15 mm broad..... 7.
Leaves more than 15 mm broad..... 8.

7. Stems creeping: leaves all turned to one side of stem and very narrow, 7–10
mm broad..... 8. *P. parvula*.
Stems erect: phyllotaxis normal, most leaves 10 mm or more broad..... 9. *P. simplex*.

8. Leaves less than 25 mm broad..... 9.
Leaves more than 25 mm broad..... 10.

9. Heads 6 cm long, bracts 5 cm, perianth 4·5 cm, lip 15 mm..... 10. *P. transvaalensis*.
Heads 5 cm long, bracts 3·5 cm, perianth 3·5 cm, lip 10 mm..... 9. *P. simplex*.

10. Venation prominent, leaves thin and turning black when dry: perianth lip
15 mm..... 10. *P. transvaalensis*.

Venation indistinct, leaves thick and turning grey when dry: perianth lip
12 mm..... 7. *P. dracomontana*.

Section IV.—LASIOCEPHALAE. Heads small to medium-sized, 4–8 cm long (rarely to 10 cm), conical or globose, bracts greenish, hairy, with silvery or russet pubescence, very much shorter than the flowers.

1. Adult leaves glabrous; bracts covered with dense silvery pubescence; heads always solitary, terminal..... 11. *P. gaguedi*.
Adult leaves hairy; bracts with thin silvery to russet pubescence; heads often lateral and/or clustered..... 2.
2. Leaves densely clothed with fine silky hairs and with longer russet hairs on the lower half of the midrib and base..... 12a. *P. hirta* subsp. *hirta*.
Leaves apparently glabrescent but with closely adpressed silky hairs, especially on the base of the midrib..... 12b. *P. hirta* subsp. *glabrescens*.

Section V.—PATENTIFLORAE. Heads medium to large, 6–10 cm long, everted, bracts red or green, glabrous or hairy, very much shorter than the flowers.

1. Bracts densely rusty-pilose..... 13. *P. rubropilosa*.
Bracts glabrous or virtually so..... 2.
2. Bracts green, flowers white; leaves 3–6 cm wide..... 14. *P. comptonii*.
Bracts red, flowers pink; leaves 1–1.5 cm wide..... 15. *P. curvata*.

1. ***P. rouppelliae*** Meisn. in DC. Prodr. 14: 237 (1856); Phillips in F.C. 5: 573 (1913); Bews in Fl. Natal & Zulul.: 82 (1921); Burt-Davy in Fl. Pl. Afr., t. 133 (1924), Fl. Transv.: 211 (1926).

Type: Magaliesberg, Zeyher 1457 (K, holo.).

Scolymocephalus lanuginosus O. Ktze in Rev. Gen. Pl. 3: 279 (1891).

Protea lanuginosa K. Schum. in Just. Jahresb. 26, 1: 364 (1900).

P. transvaaliensis Gdgr. & Schinz in Bull. Soc. Bot. de France 50, 4: t. 13 (1913) non Phillips. Type: Magaliesberg, Laidley 380 (L, iso.!).

P. rudatisii Engl. in Pflanzenwelt Afr. 3, 1: 66 (1915) nomen.

A small, gnarled tree 3–5 m in height and usually assuming a neat domed form with many spreading branches from a short trunk up to 20 cm thick. Bark black, rough, deeply fissured. Flowering branchlets 8–12 mm thick, hairy when young, rapidly becoming glabrous and developing a rough black bark. *Leaves* sessile or so narrowly attenuate at the base as to appear subpetiolate, closely ranked into terminal rosettes densely enveloping the flower heads, dark green, from linear-lanceolate to obovate or even obovate-spathulate, 1.5–4.5 cm wide by 6–16 cm long (average about 2.5 × 12 cm), 5 mm broad at the base, apex acute, base narrowed; blade leathery, often somewhat stiffened, glabrous and shiny on the upper surface after shedding an initial woolly covering, midrib prominent both sides, secondary venation ditto, reticulate, without a marginal vein. *Heads* solitary, terminal, 8–12 cm long and as much in diameter, conical, shortly pedunculate, opening to 90°. Receptacle convex, 15 mm wide. *Bracts* about 10-seriate, silky-tomentose and ciliate, the outermost brownish, short, ovate, obtuse, often recurved to revolute: middle bracts silvery-pink, obovate, up to 1.5 cm broad; the innermost 8–10 cm long, exceeding the flowers, pink to rose, spathulate, only 2 mm wide in their lower part, widening to 10 mm at the top. *Perianth* 7 cm long of which 1.5 cm for the base, 3 cm for the tube and 2.5 cm for the lip and teeth; base brown, glabrous, dilated, 3-keeled and 7-nerved; tube white, hairy, rather slender; lip densely hairy, from white below to deep red above; teeth covered with pink to crimson hairs, lateral teeth 12 mm, median tooth 8 mm long. Fertile stamens 3; filaments 1 mm long, flattened; anthers linear, 3 mm long; apical glands 0.5 mm long, oblong, acute; barren stamen acute, eglandular. *Style* white, 6 cm long, curved, somewhat flattened, keeled below on the convex side, usually more or less hairy; stigma red, 9 mm long, slender, apiculate, kneed and bent at the junction with the style. *Ovary* 4 mm long. *Fruit* 15 mm long clothed with reddish-brown hairs.

Flowering mainly in autumn.

TABLE OF FLORAL AND VEGETATIVE MEASUREMENTS (MILLIMETRES).

	<i>P. roupelliae</i> .	<i>P. lacticolor</i> .	<i>P. subvestita</i> .	<i>P. caltra</i> .	<i>P. multibracteata</i> .	<i>P. rhodantha</i> var. <i>falcata</i> .	<i>P. rhodantha</i> var. <i>rhodantha</i> .	<i>P. dracomontana</i> .	<i>P. parvula</i> .	<i>P. simplex</i> .	<i>P. transvaalensis</i> .	<i>P. ragnedi</i> .	<i>P. hirta</i> subsp. <i>glabrescens</i> .	<i>P. hirta</i> subsp. <i>hirta</i> .	<i>P. rubropillosa</i> .	<i>P. complanata</i> .	<i>P. curvata</i> .
Thickness of branchlets.....	8-12	5-8	5-8	10	5-10	10-15	10-15	5	3	5	4	8-10	5-10	5	10	15-20	10
Leaf length.....	60-160	50-100	50-100	80-120	80-150	150-250	100-180	80-120	60-120	80-120	70-120	90-180	60-120	75-120	150	120-240	100-200
Leaf breadth.....	15-45	15-30	15-30	15-25	8-25	15-30	25-50	25-35	7-10	8-25	15-35	15-30	12-25	20-35	50	30-60	10-15
Ratio length: breadth.....	4-8	3-2	3-2	5-0	8-0	10-0	4-0	3-3	10-0	6-2	4-0	6-0	4-0	3-3	3-0	4-0	12-0
Head length.....	80-120	60-75	50	50-70	45-60	70-80	70-80	50-60	40	50	60	40-100	40-60	40-50	80-100	80-100	60-70
Bract length.....	80-100	60-70	50	50	40	50	50	45	30	35	50	40	30	30	40	50	40
Max. width bracts.	15	10	10	20	15	20	20	20	15	12	20	20	12	12	20	25	15
Perianth total length.....	70	60	50	40	45	50	50	40	32	35	45	50	40-50	30	60	80	50
Lip.....	25	14	10	12	15	15	15	12	10	10	15	20	15-20	12	20	30	20
Ratio perianth: lip	2-8	4-3	5-0	3-3	3-0	3-3	3-3	3-3	3-2	3-5	3-0	2-5	2-5	2-5	3-0	2-7	2-5
Teeth.....	12	2	2	1	1½	1	1	2	1	2	1	1	3	2	3	4	3
Stigma.....	9	9	5	8	7-9	10	10	8	6	5	8	6-10	8	6	12	12	10

This is one of the most decorative and horticulturally noteworthy of the *Proteas* under discussion, having large and showy heads of a predominantly red colour. It is also the most widespread in distribution, ranging from Port St. John's to the Zoutpansberg, from sea level to 6-7,000 feet, and found in practically all the mentioned veld types. In the coast belt it ranges only from Port St. John's to Durban, accompanying the outcrop of the Table Mountain sandstone. Inland, this geological preference is abandoned and it ranges almost throughout, being absent from the Dohne Sourveld and the western end of the Transvaal Bankenveld.

There is considerable variation in size and shape of leaves throughout the extended range of this species and also, though to a lesser degree, in the size of the flower heads. As however, these variations are not consistent for given localities, it is considered inadvisable to attempt to recognize varieties. The specimens studied show plants from the Coast and Midlands of Natal frequently to have the largest and softest leaves whereas those from the Central Transvaal and the Waterberg are of the opposite extreme with short, stubby leaves, very stiff. North-eastern Transvaal and upper Natal specimens tend to be intermediate, with specially narrow-leaved types from East Griqualand. The size of flower-heads is reduced in unfavourable situations and vice-versa. Transvaal specimens appear to have the bracts more noticeably silver-tomentose without than Natal specimens, while along the eastern Transvaal escarpment heads are markedly green coloured, red being limited to the lip, stigma and tip of the bracts.

SELECTED CITATIONS.

CAPE.—Matatiele: *Baur* 4975. Maclear: *Galpin* 6822. Port St. John's: *Sim* 2547.

ORANGE FREE STATE.—Harrismith: *Witzieshoek, Flanagan* 1849.

BASUTOLAND.—Mafube: *Dieterlen* 946.

NATAL.—Nkandhla: *Qudeni, Gerstner* 1862. Pietermaritzburg: *Table Mt., McLean* 145. Inanda: *Groenberg, Medley Wood* 7918.

SWAZILAND.—Dalriach: *Bolus* 12266. Mbabane: *Burt-Davy* 2789.

TRANSVAAL.—Pietersburg: *Blouberg, Codd and Dyer* 8980; 8984; *Strydompoortbergen, Maguire* 912. Rustenburg: *Magaliesberg, Zeyher* 1457; *Laidley* 380. Krugersdorp: *Mogg* 20259; 23204. Belfast: *Galpin* 13091. Lydenburg: *Sekukuniland, Barnard* 311. Soutpansberg: *Galpin* 14950. Pietersburg: *Houtbosch, Bolus* 10951. Pilgrim's Rest: *Graskop, Galpin* 14486. Barberton: *Burt-Davy* 353.

2. *P. lacticolor* *Salisb.* in *Parad. Lond.* t. 27 (1806); *Phillips* in *F.C.* 5: 578 (1913). *Protea orientalis* *Sim* in *For. Flor. Cap.* 296: t. 128 (1907).

Type: *Pirie, Sim* 1478 (BOL, CTM, iso!).

A small spreading tree up to 4 m in height generally with a neat, domed form. Trunk up to 20 cm in diameter with grey smooth bark, horizontally ringed. Flowering branchlets 5-8 mm thick, somewhat woolly-hairy in youth, later glabrous with smooth pale brown bark. *Leaves* sessile, densely crowded into rosettes at the end of the branchlets, dark green, oblong, 1.5-3 cm wide by 5-10 cm long (average about 2.5 × 8 cm), apex obtuse or subacute, narrowed at the base; blade rigid, in youth covered somewhat with hairs which later disappear or persist only on the midrib or base, minutely punctate, distinctly veined: midrib yellow, slightly prominent both sides. Axillary buds conspicuous. *Heads* solitary, terminal, fairly constant in size, 6-7.5 cm long and as much in diameter when open, sessile, campanulate, expanding only to a narrow angle, enclosed by a few bracteolar foliage leaves. Receptacle flat to slightly convex,

12–15 mm wide. *Bracts* 6–8 seriate, the outer pinkish or greenish-brown, acute, silky-pubescent, ciliate and with an apical tuft of hairs: the inner either white or pink, 1 cm wide at broadest, tips obtuse, white-ciliate, recurved outwards, 6–7 cm long, exceeding the perianths but not the styles. *Perianth* very slender and thin in the upper half which is eventually spirally coiled up and withdrawn from the styles, reddish-hairy except at the base, 6 cm long of which 18 mm for the base, 28 mm for the tube and 14 mm for the lip; lip glabrous, 3-toothed; lateral teeth 1.5–2 mm long, red or white hairy; stamens all fertile, subsessile; anthers linear, 9 mm long, apical glands $\frac{1}{2}$ mm long, ovate, obtuse, swollen on the inner face. *Style* white, glabrous, 6.5 cm long, straight, tapering above, compressed below, subterete above, grooved on one side; stigma red or white, very slender, 9 mm long passing with an abrupt thickening into the style. *Ovary* 3 mm long. *Fruit* curved, 5 mm long clothed with long brown hairs.

Flowers in late summer (February to April).

This species is essentially an inhabitant of the Cape *fynbos* from Worcester to Uitenhage, entering the summer rainfall area in the Amatola and associated mountains.

Its taxonomic identity has been accepted without critical study, following Phillips in *Flora Capensis*. The original description was in 1806 and the name ("milk-coloured") refers to the white colour of the heads. Actually pink-headed forms seem to be at least equally common. Perhaps for this reason Meisner changed the name to *P. latericolor* ("brick-coloured").

SELECTED CITATIONS.

CAPE.—Stockenström: Katberg, Dyer 369. Keiskamahoe: Hogsback, Beard 759. Stutterheim: Mountains, Flanagan 1703. King William's Town: Pirie, Sim 1478.

Phillips and Stapf in *Fl. Cap.* recognise a variety *orientalis* of *P. lacticolor*, based upon a reduction of *P. orientalis* Sim of which the type is Sim 1478. After examining this specimen I am unable to establish any points of difference from the type of *P. lacticolor* and accordingly cannot recognise the variety.

3. *P. subvestita* N.E. Br. in Kew Bull. 1901: 132; Phillips in F.C. 5: 578 (1913); Bews in *Fl. Natal & Zululand*. (1921).

Type: Faku's Territory (Pondoland), Sutherland s.n. (K, holo.).

The description given above for *P. lacticolor* serves for *P. subvestita* likewise, with the following amendments:—

Branchlets distinctly woolly-hairy in youth. *Leaves* covered in youth with a dense woolly layer which is later dehiscent, leaving the blade glabrous or almost so: leaves rather more fleshy, so that venation is indistinct except sometimes on the upper surface and the blade can no longer be seen to be minutely punctate. *Heads* and flowers shorter. *Heads* 5 cm long, perianth rather more thickly hairy, teeth of the lip white-woolly. *Perianth* 5 cm long of which 15 mm for the base, 25 mm for the tube and 10 mm for the lip. *Anthers* 5 mm long. *Style* 5 cm, stigma 5 mm.

P. subvestita R. Br. is so close to *P. lacticolor* that there was some temptation to reduce it in rank as a geographical subspecies. The distinguishing differences are merely such as one would expect to be associated with life at higher altitude in a more rigorous climate. *P. subvestita* is common on high mountains throughout the Highland Sourveld proper, seldom much below the 6,000 feet contour and favouring the steepest and most rocky places. None of the species of this section appear to have much fire resistance and are confined to sites where fires are less fierce.

SELECTED CITATIONS.

CAPE.—Xalanga: Cala Mission, Pegler 1650. Maclear: Tent Kop, Galpin 6824. Umtata: Baziya Mountain, Baur 624.

BASUTOLAND.—Near Qacha's Nek: Dieterlen 993.

NATAL.—Luderberg: McClean 678. Estcourt: Cathkin Park, Galpin 11748. Bergville: National Park, Pardoe, s.n. Klip River: Nr. van Reenen, Medley Wood 5631. Nkandhla: Qudenii, Gerstner 3945.

Note.—*Protea mundii* Klotzsch in Otto & Dietr. Gartenzeit. 1838: 113.

This is a winter rainfall species to which two collections from the summer rainfall area were wrongly allocated by Phillips in Fl. Cap.: Baur 624, the Baziya Mts., Umtata, and Flanagan 1703, mountains near Stutterheim. I have examined both above-numbered specimens in CTM and the former is *P. subvestita*, the latter *P. lacticolor*. It is noteworthy that Flanagan 1703 is also cited in Fl. Cap., with a slightly different locality, under *P. lacticolor*. *P. mundii* has thus never been collected east of van Staaden's Berg. It is very readily distinguished by its capitate stigmas.

4. *P. caffra* Meisn. in DC. Prodr. 14: 237 (1856); Phillips in F.C. 5: 585 (1913); Fl. Pl. Afr. t. 22, (1921), as *P. abyssinica*, in error; Burt-Davy in Fl. Transv. 211 (1926).

Type: Magaliesberg, Zeyher 1458 (P. lecto.!, CTM, iso.!).

A small gnarled tree up to 5 m in height, usually assuming a fairly neat domed form with many spreading branches from a short trunk up to 20 cm thick. Bark black, rough, deeply fissured. Flowering branchlets 10 mm or more thick (drying to less), grey-brown, glabrous. Leaves sessile, closely ranked on the flowering branchlets, pale green drying to grey-green, lanceolate or oblong-lanceolate, 1.5–2.5 cm wide by 8–12 cm long (average about 2×10 cm), 5 mm broad at the base, apex subacute or obtuse, narrowed towards the base; blade leathery, stiff, glabrous, with a thin cartilaginous margin, midrib yellow, prominent both sides, secondary venation very indistinct even in dried specimens. Heads solitary, terminal, 5–7 cm long and as much in diameter, broadly globose, pedunculate with a rather solid woody stipes 1.5 cm long, opening to 90°. Receptacle slightly convex, 25 mm wide. Bracts 5-seriate above the stipes, at first very finely silky-tomentose, soon glabrous; those on the stipes scaly, greenish or brown, outer bracts of the head greenish developing brown tips, inner pink to red, obtuse, up to 5 cm-long and 2 cm broad, slightly shorter than the flowers. The bracts are somewhat woody in this species. Perianth pinkish-white, glabrous except for fugacious hairs on the lip spirally coiled up and withdrawn in mature heads 4 cm long of which 12 mm for the base, 16 mm for the tube, and 12 mm for the lip; lateral teeth 1 mm long, median tooth under 1.5 mm; teeth tufted with fugacious tawny-white hairs. Stamens all fertile; filaments 0.5 mm long, flattened, concave; anthers linear, 9 mm long. Style white, 4 cm long, curved, tapering, flattened, keeled on both sides, glabrous; stigma 8 mm long, filiform, passing almost imperceptibly into the style. Ovary 6 mm long. Fruit 12 mm long, thickened towards the top and bent over, clothed with long brown hairs.

Flowers in summer (November to February).

Protea caffra Meisn. is characteristic of rocky ridges in the Transvaal Sour Bushveld and Bankenveld, to which areas it is confined except for outliers in the Lulu Mts. of Sekukuniland, and the mountains of the Leribe district of Basutoland. The specimens from these outlying areas have been very critically examined and are definitely *P. caffra*. In all cases this species inhabits drier, colder conditions than its relatives.

SELECTED CITATIONS.

BASUTOLAND.—Leribe: *Dieterlen* 319*.

TRANSVAAL.—Waterberg: Naboomspruit, *Galpin* 11665. Rustenburg: Magaliesberg, *Zeyher* 1458. Krugersdorp: *Mogg* 20258. Heidelberg: *Leendertz* 7682. Pietersburg: Strydpoortberge, Welcome Mine, *Beard* 859. Lydenburg: Lulu Mts., *Mogg* 16885.

5. *P. multibracteata* *Phillips* in *Kew Bull.* 1910: 230; *Phillips* in *F.C.* 5: 586 (1913); *Bews* in *Fl. Natal & Zululd.* 82 (1921).

Type: British Kaffraria, *Cooper* 86 (K, lecto.!).

Protea pegleri *Phillips* in *Kew Bull.* 1910: 230. *P. natalensis* *Phillips* l.c.: 231. *P. baurii* *Phillips* l.c.: 232. *P. flanaganii* *Phillips* l.c.: 232, in part from syntype; Gwenkala River, *Flanagan* 804 (CTM).

An irregular gnarled tree 1–5 m in height. Trunk up to 15 cm thick, bark black, thick and fissured. Flowering branchlets 5–10 mm thick, glabrous, at first greenish or reddish. *Leaves* sessile, often fairly closely ranked at the ends of the branchlets, light green, from narrowly oblong to linear, 8–25 mm wide by 8–15 cm long (average about 12 cm long, width highly variable), sometimes somewhat falcate, apex subacute to subobtuse, narrowed at the base, sometimes so much as to appear sub-petiolate; blade soft, quite glabrous, midrib red, prominent both sides, secondary venation inconspicuous in fresh leaves, moderately conspicuous, finely reticulate and prominent both sides in dried specimens, uniting near the margin but with no true marginal vein. *Heads* terminal, solitary (or in some Eastern Cape specimens, clustered), 4·5–6 cm long and 5–8 cm in diameter, turbinate, generally peduncled with a small scaly stripes some 5 mm long, opening to 160°. Receptacle slightly convex, 15–20 mm wide. *Bracts* about 7-seriate above the stipes, the outer green, at first with a glaucous bloom, the inner greenish to red, colour variable; maximum width 1·5 cm (or 2 cm in some very large heads), 4 cm long, equalling or slightly shorter than the styles, oblong, obtuse. *Perianth* white, fulvously hairy within the tube, the lip edged with fugacious pink or brownish hairs, either densely or tipped only; perianth otherwise glabrous, 4·5 cm long of which 12 mm for the base, 18 mm for the slender tube and 15 mm for the lip; lateral teeth 1·5 mm long, median 1 mm; stamens all fertile, subsessile, anthers linear, 8 mm long; the perianth spirally coiled up and withdrawn in mature flowers. *Style* white, 5–6 cm long, slightly curved or wavy, somewhat compressed, glabrous; stigma usually pink, 7–9 mm long, filiform, obtuse, passing almost imperceptibly into the style. *Ovary* 3 mm long. *Fruit* 12 mm long clothed with golden-brown hairs.

Flowers in summer (November to February).

P. multibracteata *Phillips* ranges throughout Natal and the eastern Cape in all the mentioned veld types, from the steamy flats of the Zululand coast to the Drakensberg at 7,000 feet, and south to the Amatola Mts. This is a moderately severe habitat, with some extremes of heat and cold, less cold but much hotter than that of *P. caffra*. It is everywhere accompanied by the dwarf *P. simplex* *Phillips*.

The width of the leaves varies considerably in this species, being typically very narrow at the southern end of the range and growing steadily broader towards the north. The distribution is not in contact at any point with either *P. caffra* or *P. rhodantha*.

* One of the two sheets of this number in the Natal Herbarium is *P. dracomontana* *Beard*.

SELECTED CITATIONS.

CAPE.—Kentani: *Pegler* 1872. Komgha: Gwenkala River, *Flanagan* 804. Port St. John's: *Hutchinson* 1828. British Kaffraria: *Cooper* 86. Stockenstrom: *Katberg*, *Dyer* 370. Matatiele: *Baur* 4839.

ORANGE FREE STATE.—Drakensberg, Orange Free State: *Cooper* 951.

NATAL.—Umzinto: Umtwalumi, *Beard* 745. Pinetown: Springfield, *Medley Wood* 12822. Eshowe: *Gerstner* 1863. Stanger: Tugela Beach, *Johnson* 390; 620. Richmond: *Beard* 746. Bergville: National Park, *Bayer* and *McClean* 141; Cathedral, *Killick* 1061. Nkandhla: Qudeni, *Bayer* 791. Vryheid: Hlobane, *Johnstone* 436. Ubombo: Lebombo Mts., *Sargent* s.n.

SWAZILAND.—Lebombo Mts. S. of Stegi: *Verdoorn* 1679.

TRANSVAAL.—Amersfoort: Wakkerstroom, *Beard* 747.

Phillips in *Flora Capensis* sustained *P. multibracteata*, reducing to synonymy *P. pegleri*, *P. natalensis* and *P. baurii* which had been simultaneously published in 1910. *P. flanaganii* is now also reduced as it has not been possible to establish a separate identity for this species in the field (see further discussion under *P. simplex*).

6. *P. rhodantha* Hook. f., var. *rhodantha*, in *Bot. Mag.* t. 7331 (1893); Phillips in *F.C.* 5: 586 (1913); Burt-Davy in *Fl. Transv.* 211 (1926).

Type: Cultivated at Kew, *Horn* s.n. (K, holo.).

Protea bolusii Phillips in *Kew Bull.* 1910: 231.

Type: Forbes Reef, *Bolus* 12265 (BOL, iso.).

P. stipitata Phillips l.c. 1934: 104.

Type: Haenertsburg, *Murray* s.n. (PRE, iso.).

Tree up to 15 feet in height, commonly rather less, branching low down and of rambling habit, trunk up to 50 cm thick, bark black, fissured, warty. Flowering branchlets 10–15 mm thick, glabrous, with smooth bark, at first green or pinkish, soon pale brown. *Leaves* sessile, crowded towards the end of the branchlets, green, oblong to oblanceolate, often slightly falcate or oblique, 2.5–5 cm wide by 10–18 cm long (average about 3.5×14 cm), apex subacute, narrowed at the base; blade leathery, quite glabrous, with thin, transparent, cartilaginous margin, midrib red or yellow, prominent both sides, secondary venation reticulate, prominent both sides in dried specimens, with no true marginal vein. *Heads* terminal, solitary, or, rarely, clustered, 7–8 cm long and 12 cm in diameter, turbinate, pedunculate with a well-marked scaly stipes 1 cm long, opening to 180° at anthesis. Receptacle slightly convex, 25 mm wide. *Bracts* about 6-seriate above the stipes, the outer ovate, subacuminate, green or more or less pink, at first silky-pubescent below, ciliolate; inner oblong, deep rose-colour, glabrous, up to 2 cm wide and 5 cm long, equalling or slightly shorter than the flowers. *Perianth* white suffused with pink, glabrous except within the tube where it is fulvously hairy and at first on the lip, 5 cm long of which 15 mm for the base, 20 mm for the tube and 15 mm for the lip; tube expanded below, slender above, spirally coiled up in old flowers; lip clothed at first with orange hairs, soon glabrous; teeth subequal, recurved, 1 mm long. *Anthers* linear, 10 mm long. *Style* pink or white, 5.5 cm long, distinctly swollen just above the ovary, stout when fresh, when dry becoming compressed, grooved or quadrangular, curved, glabrous; stigma 10 mm long, filiform, slightly wavy at the junction with the style. *Ovary* 3 mm long. *Fruit* 12 mm long clothed with golden-brown hairs.

Flowers in summer (December to March).

P. rhodantha Hook. f. is characteristic of the north-east Highland Sourveld and thus of the eastern Transvaal and Swaziland. The habitat is wetter and milder than that of *P. multibracteata* and more genial than that of *P. caffra*. At the southern end of its range in the Barberton mountains and Swaziland this species is represented by its variety *falcata* in which the leaves become much longer, narrower and curved.

SELECTED CITATIONS.

SWAZILAND.—Forbes Reef: *Bolus* 12265. Mbabane: *Compton* 26343.

TRANSVAAL.—Soutpansberg: Between Rumble's farm and Lejuma Peak, *Reynolds* 4109; Entabeni, *Obermeyer* 872. Pietersburg: Haenertsburg, *Murray* s.n.; Wolkberg, *Beard* 861. Pilgrim's Rest: *Beard* 871; *Horn* s.n.; Mauchsberg, *Smuts* and *Gillet* 2261. Barberton: *Meeuse* 10107.

This species has been most difficult to elucidate. *Protea rhodantha* (the "red-flowered") was figured in the Botanical Magazine in 1893 with a description by Sir Joseph Hooker from a plant raised at Kew, the seed having been presented by Mr. W. J. Horn in 1886, collected at Pilgrim's Rest in the Transvaal. Unfortunately it is somewhat likely that a plant raised in a Kew greenhouse would differ from its wild prototype, particularly in point of size: furthermore the type material that has been preserved is inadequate, consisting only of a single leaf 14.5×3 cm in size and a small head, detached and bisected, 5 cm long and 5 cm in diameter. It is hardly surprising that the species has been imperfectly understood.

In 1906 a collection of Dr. Bolus, No. 12265, was compared by him at Kew with the above type material of *P. rhodantha* and determined as that species. In Kew Bull. 1910 Phillips erected a new species, *P. bolusii*, upon this specimen but in Fl. Cap. (1913) reduced it to synonymy under *P. rhodantha*. The Bolus collection and the type are the only specimens cited in Fl. Cap. under *P. rhodantha*. In recent years specimens of a taxon found in the Natal Drakensberg have been referred to *P. rhodantha* on the authority of Kew, but no plants occurring in the Pilgrim's Rest district or elsewhere on the Transvaal Drakensberg have, so far as I am aware, been attributed to that species. In 1934 Phillips described a new species, *P. stipitata*, from Haenertsburg, "aff. *P. rhodanthae* Hook. f. sed foliis et capitulis majoribus, involucris bracteis numerosioribus inferne dense et molliter tomentosis differt".

The essential step towards an understanding of *P. rhodantha* was clearly an investigation as to what Proteas of the section *Leiocephalae* could be found in the Pilgrim's Rest district. This was carried out by Dr. A. D. Meeuse and myself in February, 1957, after first visiting at Haenertsburg the type localities of *P. stipitata* and *P. transvaalensis* and collecting them in flower. *P. stipitata* was found to be very common near Pilgrim's Rest, to the west on the road to Ohrigstad, to the east at Kowyn's Pass below Graskop and to the south all along the eastern slopes of the Mauchsberg and Mt. Anderson. At the very summit of Mt. Anderson some dwarf plants were found, sterile but apparently *P. transvaalensis*, and at the summit of the Long Tom Pass others, also sterile but demonstrably *P. parvula*.

The latter is distinctly different from *P. rhodantha* in its creeping habit and exceedingly narrow leaves. *P. transvaalensis* has about the same sized heads and leaves as the type of *P. rhodantha* but its leaves are distinctive, turning black when dried and of different shape: the head also is of different shape, long in proportion to breadth. It must be admitted that *P. stipitata* comes closest to *P. rhodantha*. The leaves are a very good match and the floral characters agree if we allow for reduction in size due to stunting in the Kew cultivated specimen. The common and conspicuous distribution of this form near Pilgrim's Rest makes it very likely that its seeds would have been collected by Mr. Horn. It is accordingly concluded that *P. stipitata* falls into synonymy under *P. rhodantha*.

The Natal Drakensberg specimens belong to a distinct species that is not found in the Pilgrim's Rest district and thus they cannot be *P. rhodantha*. They are placed under *P. dracomontana*.

6a. *P. rhodantha* Hook. f., var. *falcata* Beard, var. nov.

Type: Barberton, Beard 810 (PRE, holo.).

A varietate *rhodantha* foliis subter attenuatissimis, saepe quasi petiolatis, demissis, falcatis tamen subter inflexis, longioribus differt.

At the southern end of the range of this species, in the Barberton mountains, one finds mainly this varietal form which differs from typical *P. rhodantha* only in its very long, drooping and falcate leaves, as follows:—

Leaves frequently so long attenuate at the base as to appear petiolate, grey-green, drooping, very variable as to size and shape, linear-oblongate to oblongate, almost always falcate or at least curved in the lower half, 1·5–3 cm wide by 15–25 cm long (average about 2×20 cm), apex obtuse, base cuneate; blade glabrous, with a membranous margin, midrib sub-prominent, secondary venation indistinct.

SWAZILAND.—Ngwenya Mts.: Compton 835 in herb. J. S. Beard. Mbabane: Compton 23825.

TRANSVAAL.—Barberton: Makonjwa Mts., Beard 810; Meuse 10117; Pott 5676; Clarke s.n.

7. *P. dracomontana* Beard, sp. nov.

Type: Cathedral Peak, Killick 1337 (PRE, holo.!, NH, iso.!).

Frutex divaricata 1–1·5 m alta, vel saepe nana ramulis simplicibus ex radice crasso editis. Folia elliptica, 3 cm lata, 10 cm longa, lamina crassa, rigida, glabra, margine translucente. Capitula terminalia, solitaria vel fasciculata, 5–6 cm longa. Involucris bractae 5-seriatae, rubrae vel rubrescente-virides, ciliatae, 4·5 cm longae. Calyx punicea, tubo intus fulvo-piloso, limbo capillis fugacibus cristato. Stylus 4 cm longus, stigma 8 mm.

Potentially a divaricate shrub up to 1 metre tall, rarely 1·5 m, but most commonly adopting a dwarf form with numerous simple stems 30–50 cm long arising from a thick rootstock and repeatedly killed back by fire or frost. Shoots woody, 5 mm thick, bark reddish, glabrous. Leaves bluish-green, sessile, evenly spaced along the shoots, elliptic, 2·5–3·5 cm wide by 8–12 cm long (average about 3×10 cm), apex obtuse, base cuneate; blade thick, stiff, quite glabrous, midrib red, prominent both sides in the lower $\frac{2}{3}$ of the leaf, secondary venation inconspicuous, the main veins slightly prominent below; margin translucent. Heads terminal, solitary or clustered, 5–6 cm long by 7 cm in diameter, oblong to turbinate, pedunculate with a small scaly stipes 0·5 cm long, opening to 180° at anthesis. Receptacle convex, 2 cm broad. Bracts about 5-seriate above the stipes, red or green edged with red, minutely ciliate, otherwise glabrous, up to 2 cm broad and 4·5 cm long, equalling or slightly exceeding the flowers. Perianth pink, fulvously pilose within the tube and on the lip (the latter hairs fugacious), otherwise glabrous, 4 cm long of which 12 mm for the base, 16 for the tube and 12 for the lip: teeth subequal, 2 mm long. Anthers linear, 6 mm long. Style white, flattened and grooved, 4 cm long, glabrous: stigma slender, 8 mm long, slightly wavy at the junction with the style. Ovary 2–3 mm long. Fruit 12 mm long clothed with golden-brown hairs.

PLATE I.

Flowers in summer.

Confined to the Natal Drakensberg from Underberg round to Leribe in Basutoland, at a high level between 6,000 and 8,000 feet elevation, on the basalt.

BASUTOLAND.—Leribe: *Dieterlen* 319 (in part).

NATAL.—Underberg: Himeville, *Bews* 36. Estcourt: Giant's Castle, *Bruyns-Haylett* 52; Highmoor Forest Reserve, v. *Rensburg* 4. Bergville: Cathedral Peak, *Killick* 1638; 1337, *Beard* 729; *Esterhuysen* s.n.; Ndedema, *Esterhuysen* 17367; Mweni, *Esterhuysen* 14673; National Park, *Hutchinson*, *Forbes* and *Verdoorn* 89; *Pardoe* s.n.; *Edwards* 505; 508.

The various collections of this species which exist in S. African herbaria have previously been referred to *P. rhodantha* Hook. f. On acquaintance with the population in the field, it is found to be a distinct taxon differing completely in its broad, fleshy leaves from any of the most nearly related species. As it does not occur in the Pilgrim's Rest district it cannot be *P. rhodantha* and is accordingly named as new.

8. *P. parvula* Beard, sp. nov.

Type: Dullstroom, *Galpin* 13149 (PRE, holo.!).

Suffrutex caulibus subterraneis, ramulis prostratis glabris. *Folia* sessilia, erecta, anguste lineare-oblongata, 8 mm lata, 8 cm longa, saepe aliquantum falcata, apice acuta, ad basin versus attenuatissima. *Capitulum* 4 cm longum, stipitatum. *Involucris* bracteae 5-seriatae, puniceae, glabrae, 3 cm longae. *Calyx* alba, glabra capillis paucis, 3.2 cm longa, limbus dentatus 1 cm longus, dentes 1 mm, cristati. *Stylus* 3 cm longus, glaber, compressus; stigma 6 mm filiforme, apice obtusum.

A small woody plant with branching underground stems 1–2 cm thick. Aerial flowering branchlets prostrate, 3 mm thick, glabrous with pale greenish to reddish bark. *Leaves* sessile, closely ranked, all turned to an erect position on the same side of the stem, light green, narrowly linear-oblongate, 7–10 mm wide at the broadest point by 6–12 cm long (average about 0.8×8.0 cm), often somewhat falcate, apex acute to sub-rotundate, very long attenuate at the base: blade coriaceous, glabrous, with a thin membranous margin, midrib yellow, prominent below, sub-prominent above; secondary veins fairly distinct, arching and prolonged close to the margin so as to give the impression of a continuous marginal vein. *Heads* solitary, terminal, 4 cm long and as much in diameter when open, globose, pedunculate with a slender scaly stipes 7 mm long, opening to 160° at anthesis. Receptacle convex, 15 mm wide. *Bracts* 5-seriate above the stipes, pale pink, glabrous, up to 15 mm broad and 3 cm long, equalling the flowers, obtuse, shortly ciliate. Perianth creamy-white flushed with pink, glabrous except for a variable pilosity along the inner edges of the tube and the tufted teeth; 3.2 cm long of which 10 mm for the base, 12 mm for the tube and 10 mm for the lip: lateral teeth 1 mm long with a tuft of hairs. *Anthers* linear, 6 mm long. *Style* white, 3 cm long, glabrous, compressed and grooved, bulbously swollen above the ovary; stigma 6 mm, slender, obtuse, passing almost imperceptibly into the style. *Ovary* 2 mm long. *Fruit* clothed with long brown hairs.

Flowers in midsummer, (December to January).

This species is among the smallest of the creeping Proteas. It is localised on certain mountain tops in the Eastern Transvaal at 5,500 to 7,000 feet elevation, in very short grassland.

TRANSVAAL.—Belfast: Suikerboskop, *Galpin* 13149; *Bruce* 492. Pilgrim's Rest: Mariepskop, Hebronberg, *Beard* 868. Lydenburg: Steenkampsberg, *Codd* 1715; *Acocks* 12922; Mount Anderson, *Smuts* and *Gillett* 2380; Makobulaan, *Beard* 874. Nelspruit: Kaapsche Hoop, on top of the mountain, *Phillips* 3464; v. d. *Merwe* 1538.

9. *P. simplex* Phillips in Kew Bull. 1910: 230; Phillips in F.C. 5: 588 (1913); Bews in Fl. Natal & Zululd. 82 (1921); Burt-Davy in Fl. Transv. 211 (1926).
Type: Maclear, *Galpin* 6823 (K, lecto. PRE, BOL, GRA, iso.!).

Protea doddii Phillips in Kew Bull. 1911: 82.

Type: East London, *Galpin* 7936.

- P. flanaganii* Phillips l.c. 1910: 232 in part, from syntype: Kentani, *Pegler* 274 (GRA, PRE, BOL, CTM).

A dwarf shrub with a thick underground rootstock from which arise numerous simple, ephemeral erect stems, 5 mm thick and up to 50 cm long, glabrous with pink to green bark. *Leaves* sessile, deep green, arranged all along the shoots, from narrowly oblong to linear, very variable as to size, (especially in width), from 8–25 mm wide by 8–12 cm long (average about 16 mm × 10 cm), apex subacute to sub-obtuse, base cuneate; blade leathery, glabrous, midrib red or yellowish, prominent both sides, secondary venation prominent. *Heads* solitary, terminal, 5 cm long and as much in diameter, turbinate, generally peduncled with a small scaly stipes some 5 mm long, opening to 160° at anthesis. Receptacle convex, 15 mm broad. *Bracts* about 5-seriate above the stipes, the outer green, the inner greenish to red, 3·5 cm long and up to 12 mm broad, equalling or slightly shorter than the styles. *Perianth* white, fulvously hairy within the tube, the lip edged and tufted with fugacious pink or brownish hairs; perianth otherwise glabrous, 3·5 cm long of which 10 mm for the base, 15 mm for the tube and 10 mm for the lip: teeth up to 2 mm long with fugacious tuft of orange hairs. *Anthers* linear, 6 mm long. *Style* white, 4 cm long, somewhat compressed, glabrous; stigma usually pink, 5 mm long, filiform, obtuse, passing almost imperceptibly into the style. *Ovary* 2 mm long. *Fruit* 12 mm long clothed with golden-brown hairs.

Flowers in summer.

Found in the Dohne Sourveld, Highland Sourveld and Coast Belt, accompanying *P. multibracteata*, also in the N.E. Highland Sourveld in Swaziland.

SELECTED CITATIONS.

CAPE.—East London: *Dodd* in Herb. *Galpin* 7936. Keiskamahoe: *Story* 3836. Kentani: *Pegler* 274; 1871. Lusikisiki: *Galpin* 10999. Xalanga: *Cala*, *Pegler* 1651. Maclear: *Galpin* 6823.

NATAL.—Inanda: Field's Hill, *Medley Wood* 12316. Eshowe: *Lawn* 350. Underberg: *McClellan* 725. Bergville: Champagne Castle, *Bayer* 1440. Lion's River: Howick, *Parkinson* s.n. Nkandhla: Qudeni, *Gerstner* 639. Pietermaritzburg: *McClellan* 153. Umvoti: Greytown, *Galpin* 14836.

SWAZILAND.—Mbabane: *Bolus* 12264; *Burt-Davy* 2896. Forbes Reef, *Burt-Davy* 2767.

After field study and consideration of the herbarium material I have come to the conclusion that there is no valid reason for the separation of *P. doddii* which is accordingly reduced. There has further been a strong feeling towards reducing both these species under *P. multibracteata*. The following long-hand note by E. E. Galpin was found on an isotype specimen of *P. doddii* in the Albany Museum: "I am very doubtful as to whether *P. multibracteata*, *P. flanaganii*, *P. simplex* and *P. doddii* are not all varietal forms of one species. The length of the scaly stipes supporting the flower head and causing it to be either pedunculate or sub-sessile, from examination of specimens of *P. multibracteata* from the same spot appears to me to be a matter of luxuriance". Galpin had a profound knowledge of plants in the field. Support has now been lent

to his view by the reduction of *P. flanaganii* partly under *P. multibracteata* and of *P. doddii* under *P. simplex*, leaving us with two species, one arborescent and one dwarf, which clearly stand in a special relation to each other.

The ranges of these two species are almost identical and they almost invariably accompany one another in the same locality, the main exceptions being in the Natal Drakensberg where *simplex* forms are rare, and in Swaziland where *P. multibracteata* is absent. A few of the herbarium specimens seem to be intermediate and intermediate forms have been found in the wild though unfortunately always sterile. There is a sharp distinction between the species in stature and habit: otherwise the only difference in vegetative and floral characters is in size, all parts being proportionately smaller in *P. simplex*. It is suspected that *P. multibracteata* carries a gene for miniature habit, which may be selected by veld burning, leading to the establishment of dwarf populations which are genetically incapable of assuming an arborescent habit even if protected against veld fires. This theory is being tested experimentally. In the meantime, pending clarification of the relationship between them the two species are conserved separately.

10. *P. transvaalensis* Phillips in Kew Bull. 1911: 84; Phillips in F.C. 5: 587 (1913); Burt-Davy in Fl. Transv. 211 (1926).

Type: Pietersburg, Burt-Davy 5179 (K, holo.!).

A small dwarf shrub with numerous ephemeral simple stems 20–30 cm long arising from an underground rootstock. Stems 4 mm thick, glabrous, pale green or pink. Leaves spaced along the stems, sessile, bright green, black when dried, linear-elliptic to oblong, 1.5–3.5 cm wide by 7–12 cm long (average about 2×8 cm), apex obtuse, base cuneate: blade erect and somewhat stiffened, glabrous, midrib yellow or red-veined, prominent both sides, secondary venation ditto, margin translucent. Heads solitary, terminal, 6 cm long and as much in diameter, narrowly cylindrical-turbinate, pedunculate with a small stipes 0.5 cm long, or virtually sessile opening to 130° at anthesis. Receptacle convex, 15 mm wide. Bracts only 4-seriate, pale green, glabrous, the innermost commonly pink-tipped and with a fugacious russet pubescence in the upper part, up to 2 cm broad and 5 cm long, acute, equalling the flowers. Perianth white, fulvously hairy within the tube, the lip clothed at first with fugacious tawny hairs, otherwise glabrous; 4.5 cm long of which 15 mm for the base, 15 mm for the broad tube and 15 mm for the lip; teeth indistinct, laterals 1 mm long. Anthers linear, 10 mm long. Style white, 5 cm long, glabrous, terete: stigma pinkish, 8 mm long, passing almost imperceptibly into the style. Ovary 3 mm long. Fruit 10 mm long, clothed with golden-brown hairs.

Flowers in summer.

This is a small low-growing species found in mountain grasslands of the Haenertsburg area.

There is some confusion as to the type locality. The sheet bearing the type at Kew (Burt-Davy 5179) is marked "Goedgeluk, Zoutpansberg" and is so cited in F. Cap. However, in Fl. Transv. 1: 211 Burt-Davy cites his own number 5179 as "Pietersburg, Houtboschberg" while his register says "hillsides above Diepkloof". We have not been able to trace any such locality at Goedgeluk, but the farm Diepkloof is a short distance to the north of the Houtboschberg. The type therefore evidently came from somewhere on the Woodbush ridge.

TRANSVAAL.—Pietersburg District, Haenertsburg area: Houtboschberg, Burt-Davy 5179; Suikerbosrand, Thompson s.n.; Beard 858; Iron Crown, Beard 860; Wolkberg, Beard 862; Meeuse 9861.

11. *P. gagedi* Gmel. in Ed. 13, Linn. Syst. Nat. 2,1: 225 (1791).

Protea abyssinica Willd. in Species Plantarum 1: 522 (1798). R. Brown in Trans. Linn. Soc. 10: 85 (1810); Richard in Tent. Fl. Abyss. 2: 232 (1851); Meisner in DC. Prodr. 14: 237 (1856); Phillips in F.C. 5: 581 (1913); Baker and Wright in F.T.A. 6, 1: 199 (1913); Bews in Fl. Natal & Zululand. 82 (1921); Burt-Davy in Fl. Transv. 211 (1926).

Type: none appears to have been preserved.

P. trigona Phillips in Kew Bull. 1910, 230.

Type: Pretoria, Leendertz 679 (PRE, iso.).

Gagedi (nom. vern.) Bruce, Abyss. 5: 52 (1790).

Small gnarled tree not exceeding (in South Africa) 4 m in height, generally 2 m, less in adverse situations. Trunk 10 cm in diameter with pale brown, flaky, bark. Flowering branchlets 8–10 mm thick, drying to 5 mm, pubescent when young, soon glabrous and developing a thin dehiscent and papery bark cracking to show a reddish mealy surface beneath. *Leaves* sessile, closely ranked, light green, linear-lanceolate or -oblanceolate, 1.5–3 cm wide by 9–18 cm long (average about 2×12 cm), 4–8 mm broad at the base, sometimes slightly falcate, apex obtuse, base cuneate, blade leathery, glabrous except in extreme youth when it may be densely pubescent, midrib yellow, prominent both sides, secondary venation finely reticulate, prominent both sides in dried specimens, no distinct marginal vein. *Heads* solitary, terminal, varying considerably in size from 4–10 cm in length and as much in diameter, broadly globose, generally pedunculate with a well marked scaly stipes 1.5 cm long, though some heads are virtually sessile: opening to 160° at anthesis. Receptacle slightly convex, 15 mm wide. *Bracts* about 6-seriate above the stipes, pale green with dense silvery pubescence, sometimes rose tinted above, 2 cm wide at their broadest, up to 4 cm long, much shorter than the flowers, obtuse with short white ciliate fringe. *Perianth* densely hairy, the base and tube whitish or fulvous, lip pure white or rose tinted, 5 cm long of which 1 cm for the base, 2 cm each for the tube and lip; tube glabrous within, lip covered with shaggy hairs except on the back which is glabrous or almost so, or with a line of hairs along the median keel; teeth not readily distinguishable, about 1 mm long. *Anthers* linear, 10 mm long. *Style* white, about 6 cm long, glabrous, flattened or triangular below, terete above: stigma white, slender, 6–10 mm long, passing with a slight bend, into the style. *Ovary* 3 mm long. *Fruit* 1 cm long clothed with pale golden-brown hairs.

Flowering mainly in winter.

P. gagedi Gmel. ranges right through tropical Africa as far as Abyssinia, where it was first found and described. “Gagedi” is a vernacular name in those parts. In the Union, it follows the eastern escarpment, with interior outliers only on the Magaliesberg, right down from the Zoutpansberg into Zululand where a collection of the writer’s establishes its extreme southerly limit at the gorge of the Insuzi river in the Nkandhla district, just north of the Tugela. Sometimes this species is found within the North East Highland Sourveld, often just outside it, under rather drier and hotter conditions merging to Bushveld. It seems to demand less rainfall than others and is generally found on the rockiest of ground.

SELECTED CITATIONS.

NATAL.—Utrecht: Thode A385. Ngotshe: Louwsburg, Dyer 5029. Nkandhla: Insuzi River, Beard 799.

SWAZILAND.—Mbabane: Miller 5142.

TRANSVAAL.—Soutpansberg: Makonde, *van Warmelo* 5117/9. Pietersburg: Wolkberg, *Gerstner* 5607. Pilgrim's Rest: *Galpin* 14312. Barberton: *Thorncroft* 3061. Pretoria: *Leendertz* 679. Rustenburg: *Pegler* 941.

This species is the subject of the only name change effected in this paper, being the one hitherto known in South Africa as *P. abyssinica* Willd. The evidence supporting this change is as follows. A plant in the vicinity of Lamalmon, Abyssinia, was described in semi-technical terms under its native name Gaguedi by Bruce in his "Travels to Discover the Source of the Nile" 1790, with two illustrations. This plant was named scientifically as *Protea gaguedi* by Gmelin in his edition (No. 13) of Linnaeus' Syst. Nat. in 1791 and as *Protea abyssinica* by Willdenow in Species Plantarum, 1798. As both authors made it clear that they were describing Bruce's plant, there is no doubt that *P. gaguedi* is the valid name. We next have to decide whether our South African plants are conspecific with Bruce's, which might be a thorny problem since the eighteenth century descriptions are of the briefest and vaguest and Bruce's illustrations are stylised and might be almost any *Protea*. Fortunately, only one species of *Protea* has ever been collected in Abyssinia and we can thus be tolerably certain that it is *P. gaguedi*. South African specimens believed to be *P. gaguedi* have been compared at Kew with Abyssinian material by Mr. D. J. B. Killick at the writer's request and pronounced identical. *P. trigona* Phillips is now reduced to synonymy under *P. gaguedi* after examination of an isotype in the Transvaal Museum collection.

12. *P. hirta* Klotzsch in Flora, 76 (1845) and Beitrag Fl. Kap.- und Natal, 140 (1846), aggregate species.

Shrub or small tree, up to 3 m in height, rarely in dwarf form with underground rootstock emitting numerous stems up to 70 cm tall, almost invariably simple. *Stems* pale green to brown or silvery when young, densely hirsute, at length brown and glabrous, up to 10 mm thick. *Leaves* sessile, numerous, russet-green, oblong to oblanceolate, 2-3.5 cm wide by 6-12 cm long (average about 3 × 10 cm), apex rounded or acute, base broad, rounded and even slightly auriculate: blade leathery, densely clothed with fine silky white hairs, and with longer russet hairs on the lower half of the midrib and base: midrib prominent both sides, secondary veins not numerous, irregular, prominent both sides, uniting to form an irregular marginal vein. *Heads* terminal or lateral, solitary or clustered, 4-6 cm long and 5-7 cm in diameter when fully open, conical, generally pedunculate with a small scaly stipes 1 cm long: opening to 180° at anthesis. Receptacle slightly convex, 12 mm wide. *Bracts* 4-8 seriate above the stipes, russet-green to yellow, often pink in bud, densely silky-tomentose, 12 mm wide at their broadest, up to 3 cm long and equalling or only slightly shorter than the flowers, obtuse, shortly ciliate at the tip. *Perianth* densely whitish-hairy, 3-5 cm long of which 8-10 mm for the base, 10-20 mm for the tube and 12-20 mm for the lip; tube glabrous within, lip covered with shaggy hairs except on the back which is glabrous or almost so, or with a few hairs along the median keel; lateral teeth 2-3 mm long, intermediate much shorter, tufted with russet hairs. *Anthers* linear, 6 mm long, connective shortly produced into a capitate gland. *Style* white, 3-5 cm long, flattened, curved; stigma 6-8 mm long, filiform, passing with an S-bend into the style. *Ovary* 4 mm long. *Fruit* 6 mm long, clothed with pale, straw-coloured hairs.

Flowering in mid-summer to autumn.

P. hirta, aptly "the hairy *Protea*" was the earliest of the summer rainfall *Proteas* to be discovered, collected in Natal by Krauss at the early date of 1838. The type locality, *ad radicem montium Tafelberge prope fluv. Umlaas, Natal, alt. 800-1,500 ft. (bunt. Sandstein)*, is thought to be somewhere near Mariannhill. For some time there was doubt as to the identity of Transvaal plants which do not conform entirely to the Natal type. This difficulty has been resolved by the foundation of a new subspecies, *glabrescens*. In the course of fieldwork in Rhodesia and East Africa it became clear

that *P. hirta* also extended there, although it had hitherto been classified under a number of different names. After examination of the types of these species they can now be reduced to synonymy under the aggregate species though more field work will be required before they can be divided into subspecies. These are:

SOUTHERN RHODESIA.—*P. swynnertonii* S. Moore in J. Linn. Soc. Bot. 40: 184 (1911). The type (Swynnerton 1411) can no longer be found at the British Museum. From description, however, and from collecting in the type locality, there is no hesitation in reducing the species.

ANGOLA.—*P. welwitschii* Engl., Hochgebirgsfl. Trop. Afr. 196 (1892). The syntypes, (Welwitsch 1600 and 1602 B) show somewhat narrow leaves and if this proves typical of Angola specimens, recognition of a subspecies will be appropriate.

BELGIAN CONGO (KATANGA).—*P. obtusifolia* de Wild. in Ann. Soc. Sc. Brux. 40, 2: 84 (1921) non Buek ex Meisn. in DC. Prodr. (1856). This was reduced to synonymy under *P. goetzeana* Engl. by Hauman in Bull. Jard. Bot. Brux. 17 (1946). In any case the name is illegitimate, being preoccupied.

Type: Homble 1253 (BR).

BELGIAN CONGO.—*P. congensis* Engl. Jahrb. 33: 129 (1904).

Type: Descamps s.n. (B).

UGANDA.—*P. melliodora* Dale in Indigenous Trees of the Uganda Protectorate, non Engler & Gilg. Greenway & Eggeling 7069 (EA).

TANGANYIKA.—*P. goetzeana* Engl. Jahrb. 30: 298 (1902).

Type: Goetze 1367 (B).

P. eickii Engl. Jahrb. 33: 130 (1904).

Type: Eick 39 (B).

It is probable that we must also include:

TANGANYIKA.—*P. uhehensis* Engl. Jahrb. 27: 380 (1901).

Type: Goetze 720 (B). This specimen has an abnormally large head.

I have no doubt that all these forms represent a single, widespread, variable species. They are united by such characters as the unusually pale, straw-coloured seed hairs (which unfortunately darken with age so that this is unreliable in the herbarium) and the triangular appendage to the anthers.

(a) subsp. *hirta*.

P. hirta Klotzsch in Flora, 67 (1845) and Beitrag Fl. Kap.- und Natal, 140 (1846); Meisn. in DC. Prodr. 14: 236 (1856); Medley Wood in Pl. Natal 3: t. 218 (1902); Phillips in F.C. 5: 582 (1913) in part; Bews in Fl. Natal & Zulul. 82 (1921).

Type: Umlaas Riv., Krauss 202 (B, holo.!).

Growing as it does at the extreme southerly limit of the range of the species, this subspecies exhibits reduction in size and is commonly found as a low shrub less than 1 m high, often with numerous ephemeral stems arising from a rootstock. *Stems* only 5 mm thick. *Leaves* as for aggregate species. *Heads* generally solitary and terminal only, 4–5 cm long, bracts 4–5-seriate. *Perianth* 3 cm long of which 8 cm for the base, 10 mm for the tube and 12 mm for the lip. *Style* 3·5 cm long, stigma 6 mm.

A rare plant, found in the Natal Coast belt from Umzinto to Nkandhla on outcrops of Table Mountain Sandstone, and still more rarely on the eastern Transvaal escarpment.

NATAL.—Pietermaritzburg: Table Mt., McClean 165; Sim 19402. Umvoti: Seven Oaks, Beard 727; 772; 883. Umzinto: Dumisa, Fairfield, Bayer 1418. Pine-town: Blackhill, Hesom s.n. Near Umlaas River: Krauss 202. Spring Grange, Platt s.n. Springfield: Moonsamy s.n. Kloof: Dohse Landell and Shepherd 39. Inanda: Medley Wood 577. Nkandhla: Wylie in herb. Medley Wood 8757.

TRANSVAAL.—Lydenburg: Beard 875.

(b) subsp. *glabrescens* Beard, subsp. nov.

P. hirta sensu Phillips in F.C. 5: 582 (1913) in part; sensu Burt-Davy in Fl. Transv. 211 (1926).

Type: Pretoria, Meeuse 9052 (PRE, holo.!).

Frutex ramosus a subspecie *hirta* foliis minoribus demum manifeste glabrescentibus, capitulis majoribus saepe lateralibus et fasciculatis differt.

This subspecies is characterised as follows:—

A divaricate shrub generally about 1 m high, sometimes rather less, sometimes up to 3 m. Branchlets 5–10 mm thick. *Leaves* oblong to oblanceolate, very variable as to size from 12–25 mm in width and 6–12 cm long, (average about 2×8 cm), apex obtuse, base attenuate; blade coriaceous, densely pubescent in youth, at length apparently glabrescent but with closely adpressed fine silky hairs, especially on the base of the midrib. *Heads* terminal or lateral, very commonly in groups of two to four or more, 4–6 cm long. *Bracts* 5–8-seriate, often pink in bud, russet to yellow with fine silvery pubescence, much shorter than the flowers. *Perianth* 4–5 cm long of which 10–12 for the base and 15–20 each for the tube and lip: lateral teeth 3 mm, median 2 mm. *Style* 5 cm long, stigma 8 mm.

Flowers in summer.

Locally frequent in the Bankenveld and Sour Bushveld of the Transvaal on sandy flats.

SELECTED CITATIONS.

TRANSSVAAL.—Middelburg: Smith 3470. Belfast: Machadodorp, Marais 11. Waterberg: Warmbaths, Marloth 3807; Geelhoutkop, Breyer 30236. Potgietersrust: Galpin 8834. Pretoria: Hammanskraal, Codd 7045; Nature Reserve, Meeuse 9052. Rustenburg: Dyer and Verdoorn 3925. Johannesburg: Burt-Davy 4002. Ventersdorp: Mabaalstad, Louw 1900.

13. *P. rubropilosa* Beard, sp. nov.

Type: Pietersburg Dist., Wolkberg, S. Thompson 828 in herb. J. S. Beard (PRE, holo.!).

Arbor usque 8 m alta cortice nigro, ramulis glabris, aereis, 1 cm crassis. *Folia* sessilia, obovata, 5 cm lata, 15 cm longa, apice rotundata, inferne angustata; lamina glaberrima, nervis utrinque prominentibus. *Capitulum* 8 cm longum, sive sessile. *Involucri* bractee 7 seriatæ supra stipitem, subcutae, extrinsecus dense rubro-pilosae ac margine rubro-ciliatae, usque 5 cm longae quam floribus multum breviores. *Calyx* 6 cm longa, inferne glabra, limbo dense albotomentoso, 2 cm longo; limbi dentes 3 mm rubro-cristati. *Stylus* puniceus, 7 cm longus, glaber; stigma 12 mm, filiforme.

Gnarled tree with spreading branches up to 8 m in height and 1 m in diameter (more commonly 5 m high and 25 cm in diameter), bark black, flaky. Flowering branchlets 1 cm thick, glabrous with shiny copper-coloured bark. *Leaves* sessile, confined to previous season's wood, dark green, obovate, 5 cm wide by 15 long, apex rounded, slightly narrowed towards the base: blade leathery, quite glabrous with a transparent margin; midrib red, prominent both sides, secondary veins irregularly reticulate, prominent both sides (with no marginal vein) *in sicco* but indistinct in fresh leaves. *Heads* solitary, terminal, 8–10 cm long and as much in diameter, globose-everted, virtually sessile, opening to 90° at anthesis and thereafter remaining open until the seed is shed. Receptacle convex, 25 mm wide. *Bracts* about 7-seriate, rosy-pink, densely rusty-pilose without and ciliate with tawny hairs 1–2 mm long, the pilosity giving the bracts a bronze metallic sheen; bracts up to 2 cm broad and 4 cm long, much shorter than the flowers, acute to rounded. *Perianth* white with rosy-red

veins on the tube and lip, 6 cm long of which 1.5 cm for the base, 2.5 for the tube and 2 cm for the lip; base and tube glabrous, lip densely white-tomentose on the sides and keel and recurved at the top: lateral teeth 3 mm, median 1 mm tufted with rusty hairs. *Anthers* linear, 12 mm long, with an apical gland. *Style* pinkish, 7 cm long, glabrous, terete; stigma filiform, 12 mm long, passing abruptly into the style. *Ovary* 3 mm long, fruit 1 cm clothed with reddish hairs.

Flowers in spring, (August to October).

This species is named from the unusually thickly pilose nature of the bracts. It is found along the north-eastern Transvaal escarpment, above 6,000 ft., from Lydenburg to the Wolkberg.

TRANSVAAL.—Lydenburg, *Keet* 1123. Mariepskop, *Beard* 865. The Downs, *Rogers* 21964. Wolkberg, *L. C. Thompson* s.n.; *Sheila Thompson* 828 in herb. J. S. Beard; *Schutte* s.n. Drakensberg without precise locality, *Kilpir* N. B. Gard. 1000/31.

14. *P. comptonii* Beard, sp. nov.

Type: Barberton, *Compton* 19781 (KIRST, Holo.).

Arbor ramis glabris 2 cm crassis. *Folia* sessilia, aliquot magna, oblanceolata, 4.5 cm lata, 18 cm longa, glabra margine rubro, nervulis in sicco utrinque prominentibus. *Capitulum* grande, 10 cm longum, sessile. *Involucri* bracteae 6-seriatae, glaberrimae, subvirides, 5 cm longae, quam floribus breviores. *Calyx* alba, glabra praeter lateribus dentibusque limbi dense villosis, 8 cm longa, limbus dentatus 3 cm, dentibus lateralibus 4 mm longis rubido-cristatis. *Stylus* albus, 8 cm longus, glaber. *Stigma* album, filiforme, 12 mm longum.

Gnarled tree up to 5 m high with a short trunk up to 20 cm diameter. Bark very thick and corky and longitudinally fissured. Flowering branchlets unusually stout, 1.5–2 cm thick, glabrous with glossy pale brown bark. *Leaves* sessile, crowded at the end of the branchlets, dark green and fleshy, oblong to oblanceolate, unusually large for this genus, 3–6 cm wide by 12–24 cm long (average about 4.5 × 18 cm), apex obtuse, often faintly retuse at the tip, base broadly attenuate, lamina 2 cm broad just above junction with stem; blade stiff, fleshy, quite glabrous, midrib red below, yellow-green above, prominent both sides, secondary venation inconspicuous in the fresh state, becoming prominent when dry on both sides; margin red, translucent. *Heads* solitary, terminal, 8–10 cm long by 10–15 cm in diameter, virtually sessile, everted, opening to 180° at anthesis and thereafter remaining wide open until the seeds are shed. Receptacle conical, 2.5 cm wide. *Bracts* about 6-seriate, pale green, quite glabrous, with a shiny waxy covering, 2.5 cm wide at their broadest, up to 5 cm long, very much shorter than the flowers, obtuse, very shortly white-ciliate. *Perianth* white, glabrous except on the sides, keel and teeth of the lip which are densely villous, 8 cm long of which 2 cm for the base, 3 for the tube and 3 for the lip which is 5 mm broad; lateral teeth 4 mm long, median tooth 1.5 mm, conspicuously tipped with reddish hairs. *Anthers* linear, 15 mm long, apical gland 1 mm. *Style* white, 8 cm long, glabrous, terete or very slightly flattened, tapering; stigma white, slender, 12 mm long, passing with a slight bend into the style. *Ovary* 3 mm long, fruit 10 mm, clothed with whitish hairs.

Flowering in autumn and winter, (May to July).

This species bears the name of Professor R. H. Compton, its first collector. It is known only from the mountains above Barberton in the eastern Transvaal, along the road from Barberton to Havelock Mine, altitude 4–5,000 ft., in grass on rocky mountain slopes, associating with *P. rouppelliae* Meisn. and *P. rhodantha* Hook. f., var. *falcata* Beard.

TRANSVAAL.—Barberton: *Compton* 19781; *Schelte* 4107; *Hamilton* 794 and 809 in herb. J. S. Beard.

15. *P. curvata* N.E. Br. in Kew Bull. 1901, 131; Phillips in F.C. 5: 580 (1913); Burt-Davy in Fl. Transv. 211 (1926).

Type: Barberton, *Galpin* 973 (K, Lecto., NH, GRA, CTM, BOL, iso.!).

A slender tree up to 6 m in height, with long ascending branches. Flowering branchlets 1 cm thick, bark smooth, grey-pink and shortly tomentose in youth, longitudinally wrinkled. *Stem* up to 15 cm diameter, bark black, scaly and fissured. *Leaves* sessile or so long attenuated at the base as to appear petiolate, closely ranked, light green, mostly somewhat falcate, linear-oblongate, 10–15 mm wide by 10–20 cm long (average about 1.3×15 cm), apex obtuse, long attenuated to 2–3 mm wide at the base: blade leathery, glabrous; midrib prominent both sides, secondary venation indistinct, irregular; blade with translucent cartilaginous margin. *Heads* solitary, terminal, 6–7 cm long and as much in diameter, globosely everted, pedunculate with a short scaly stipes 5 mm long, opening to 180° at maturity and thereafter remaining fully opened till the seed is shed. Receptacle conical, 2 cm wide. *Bracts* about 4-seriate above the stipes, grey-tomentose on the lower half, glabrous above, deep red in colour, 15 mm wide at their broadest, up to 4 cm long, very much shorter than the flowers, obtuse to sub-acute, minutely ciliate. *Perianth* rose-pink, pubescent except on the lower part of the base, and the upper part of the back of the lip, 5 cm long of which 1 cm for the base, 2 cm each for the tube and lip; tube pubescent within; lateral teeth 3 mm long, tomentose except at the glabrous tips, median tooth 2 mm filiform. *Anthers* linear, 15 mm long, with an apical gland. *Style* pink, about 6 cm long, flattened below, trigonous above, glabrous: stigma red, slender, 10 mm long, obtuse, passing with a slight bend into the style. *Ovary* 2 mm long. *Fruit* 1 cm long, and 5 mm thick at top, clothed with long red to yellow-brown hairs.

Flowers in winter, (June to July).

This extraordinary tree, so peculiar in appearance and habitat, confined as it is to a single koppie in the bushveld below Barberton, was first collected by *Galpin* in 1895, his specimen forming the basis of N. E. Brown's description in 1901. It was collected again by Thorncroft in 1919. The locality given in *Galpin*'s register is vague, "Kaa River Valley, 2,500–3,000 ft.". However the labels of all the specimens in the South African herbaria, though of the same number and written up in *Galpin*'s handwriting, bear in many cases different data as to locality. The one in the Natal Herbarium has "Caledonian" which is a siding five miles north of Barberton and with this direction Dr. P. D. Hamilton was enabled to rediscover the type locality in 1956. The precise spot is a koppie formed by an outcrop of talcose schist, rising from the north bank of the Suidkaap River slightly downstream from Caledonian. As far as is known the species is confined to this single locality, in a bushveld association with *Acacia* spp., *Pavetta edentula*, *Combretum transvaalense*, *C. apiculatum* and *Bolusanthus speciosus*.

TRANSVAAL.—Barberton: *Galpin* 973; *Thorncroft* 1053; *Hamilton* 832; 884 in herb. J. S. Beard.

REPUTED HYBRID FORMS.

P. hirta X *P. simplex*. A number of plants exist in a mixed population of the parental species near the Catholic Mission, Canema, Seven Oaks, Natal: *Dyer* 4144, *Beard* 773; 774.

P. gaguedi X *P. rhodantha*. Along road from Barberton to Havelock Mine six miles from the Barberton-Kaapmuiden main road, a single plant: *Meeuse* 10108 (1957). Both parental species present—*Meeuse* 10107, *P. rhodantha*; 10109, *P. gaguedi*.

DOUBTFUL RECORDS.

P. tenax, R. Br. Rogers 28291 (PRE), Culvers, Weenen, Natal. As this species has only otherwise been collected in the False Macchia of the Eastern Province, it is supposed that an error in labelling the specimen may have occurred.

P. grandiflora, Thunb. Rogers 22298 (PRE), Rustenburg. The locality is thought to be incorrect as in the case of the above.

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PLATE I.—*Protea dracomontana* Beard

The *Albizia* Species of South Africa.

By

L. E. Codd.

Most of the South African *Albizia* species were dealt with by Burtt Davy in his *Flowering Plants and Ferns of Transvaal and Swaziland*, Vol. 2, 1932, but several name changes have rendered it desirable to review them again. The opportunity is also taken to include those species not listed by Burtt Davy. The territory covered by the present review is made up of the Union of South Africa, South West Africa, Swaziland and Basutoland, but excludes Bechuanaland, and is therefore the area to be dealt with by the proposed *Flora of Southern Africa*. Eleven species are recorded as being indigenous in this area, while two exotic species are considered to be sufficiently naturalised to be included in this treatment. One species found in South African gardens, *A. julibrissin* Durazz., is not included because it shows no signs of becoming naturalised. This is not due to lack of opportunity because Sim, in manuscript notes, relates that 100 lbs. of seed of this species were sent to Pondoland and were sown in error for wattle seed, but there is no evidence that any plants have become established.

In addition to the material in the National Herbarium, Pretoria, specimens have been seen from the following Herbaria, whose co-operation is gratefully acknowledged: Bolus, Kirstenbosch, South African Museum, Albany Museum, Natal (Durban), Natal University (Pietermaritzburg) and the Forestry Department, Pretoria. When citing specimens, the abbreviation indicating the Herbarium is given only in cases where the gathering is not represented in the National Herbarium.

Useful assistance and advice concerning certain species with a largely tropical distribution have been freely given by Mr. J. P. M. Brenan of Kew Herbarium, while Mr. D. J. B. Killick, our liaison officer at Kew, has helped by consulting botanical material and literature not available in South Africa. I am also grateful to the Directors of the Zurich University Herbarium and of the East African Herbarium, Nairobi, for the loan of type material.

Durazzini based the genus *Albizia* on *A. julibrissin* Durazz., naming it in honour of "Il sig. Cavalier Filippo degl' Albizzi" since, he claimed, a member of this illustrious family first introduced the species into Tuscany from Constantinople in 1749. Apparently Durazzini considered that two "z's" in the middle of a latinised generic name would not be appropriate because he deliberately spelt the genus with one "z". The name was amended to "Albizzia" when it was taken up by Boivin (1834) and Bentham (1844), and this spelling has been in general use, though Mueller (1872) referred to the original spelling. Since Little (1949) drew attention to his examination of the rare publication containing Durazzini's description, several authors have reverted to the original spelling, so it is unlikely that favourable consideration would now be given to a proposal to conserve the philologically preferable spelling "Albizzia".

In *Albizia* species the stipules are herbaceous and are shed very early, unlike the African species of the closely related genus *Acacia*, where the stipules usually become hard and thorny. The main diagnostic character between the two genera, however, is to be found in the stamens which, in *Albizia*, are usually longer and are united at the base into a tube. In *Acacia*, the stamens are free or very shortly connate at the base into a shallow cup or irregular perigynous disc.

Useful timber is derived from certain species of *Albizia*, for example, *A. adianthifolia*, *A. versicolor* and *A. suluensis*, though pieces of timber size are rare in South Africa. *A. suluensis* and *A. tanganyicensis* contain a substance which causes irritation to the nose and throat when the wood is worked. The bark of some species is known to have anthelmintic properties and to contain saponins, and such species are used medicinally by various native races. According to Watt and Brandwijk, the anthelmintic action is not due to the saponins, but to other unidentified substances.

ALBIZIA

Durazz. in Magazz. Toscan. 3, 4: 11 (1772); Little, Amer. Midland Nat. 30: 510 (1945); Lawrence, Gentes Herb. 8: 44 (1949); Brenan, Kew Bull. 189 (1955); as *Albizia*, Benth. in Hook. Lond. Journ. Bot. 3: 84 (1844); Harv. in Fl. Cap. 2: 284 (1861-62); Oliv. in Fl. Trop. Afr. 2: 355 (1871); Bak. f., Leg. Trop. Afr. 855 (1930); Burt Davy, Fl. Tvl. 2: 347 (1932).

Zygia P. Br. sensu E. Mey. Comm. Pl. Afr. Austr. 165 (1836); Benth. in Hook. Lond. Journ. Bot. 3: 92 (1844); Harv. in Fl. Cap. 2: 284 (1861-62).

Trees or shrubs, unarmed. *Leaves* bipinnate usually with a gland on the petiole and often elsewhere on the pinnae; stipules herbaceous, usually early deciduous. *Inflorescence* globose or spicate, pedunculate, arranged in terminal panicles or racemes, or 1-several axillary. *Flowers* usually 5-merous, hermaphrodite or, rarely, some flowers in the inflorescence unisexual. *Calyx* campanulate to tubular, 5-toothed; teeth shorter than the tube. *Corolla* funnel shaped, deeply 5-lobed; lobes shorter than the tube. *Stamens* numerous, much exerted, connate in a tube at the base; tube included or exerted; anthers peltate on the filaments. *Ovary* oblong to lanceolate, subsessile or shortly stipitate; style filiform, usually longer than the stamens; stigma scarcely differentiated. *Pod* oblong to linear, flat, few to several seeded, papyraceous to subcoriaceous, sometimes dehiscing by the separation of the valves. *Seed* flat, ovate to orbicular, compressed; funicle filiform.

KEY TO SPECIES.

Staminal tube included within the corolla, or scarcely exerted:

Leaflets not exceeding 4 mm in width:

Inflorescence spicate..... 13. *A. lophantha*.
Inflorescence globose:

Mature leaves and twigs glabrous; calyx and corolla with a few whitish hairs..... 1. *A. brevifolia*.

Mature leaves and twigs pubescent; calyx and corolla fulvo-tomentose:

Pinnae 15-35 pairs; leaflets 25-42 pairs..... 2. *A. amara* spp.
sericocephala.

Pinnae 8-15 pairs; leaflets 16-24 pairs..... 3. *A. harveyi*.

Pinnae 2-7 pairs; leaflets 6-14 pairs..... 4. *A. forbesii*.

Leaflets exceeding 4 mm in width:

Mature leaflets persistently tomentose..... 5. *A. versicolor*.

Mature leaflets glabrous or with scattered hairs:

Leaflets 7-18 pairs or, if less, exceeding 2.4 cm in length; branchlets not spine-tipped:

Leaflet margin not crisped; stamens usually exceeding 2 cm in length:

Corolla lobes fulvo-tomentose; pedicels less than 2 mm in length:

Leaflets markedly discolorous; bark grey, not peeling in papyry flakes

6. *A. antunesiana*.

Leaflets not markedly discolorous;
bark pale brown
to whitish, peeling
in papery flakes

7. *A. tanganyicensis*.

Corolla lobes glabrous or with a fringe of
whitish hairs; pedicels
usually longer than 2
mm..... 12. *A. lebbeck*.

Leaflet margin crisped; stamens less than 2 cm in
length..... 8. *A. suluensis*.

Leaflets 2-6 pairs less than 2.5 cm in length; branchlets often
spine-tipped..... 9. *A. anthelmintica*.

Staminal tube well exerted beyond the corolla:

Leaflets 3-5 pairs..... 10. *A. evansii*.

Leaflets 6-12 pairs..... 11. *A. adianthifolia*.

INDIGENOUS SPECIES.

1. *A. brevifolia* Schinz in Bull. Herb. Boiss. ser. 2, 2: 945 (1902); Bak. f., Leg. Trop. Afr. 864 (1930).

Type: Mocambique, Zambesi area, Boruma, *Menyharth* 944 (Z, holo.!).

A. rogersii Burtt Davy, Flora Tvl. 2: xviii and 348 (1932); Codd, Trees and Shrubs, K.N.P. 56 (1951).

Type: Transvaal, Soutpansberg District, Messina, *Moss and Rogers* 66 (PRE, iso.).

A. parvifolia Burtt Davy, l.c. xvii and 348 (1932).

Syntypes: Transvaal, Soutpansberg District, near Messina, *Rogers* 19247a (PRE, iso.) and 22118.

Shrub or tree 4-15 m high, usually branching near ground level, bark grey; young parts pubescent, becoming glabrous with age. *Leaves* 8-10 cm long and 4-6 cm wide, sparingly pubescent when young, soon becoming glabrous; petiole 1-2 cm long; pinnae 6-10 pairs; leaflets 10-20 pairs, linear oblong, 3-5 mm long and 1 mm broad, oblique at the base, apex obtuse to rounded, not falcate, midrib nearly central. *Inflorescence* of 8-15 flowers; buds pubescent; peduncle 1.5-3 cm long, sparingly strigose; bracts and bracteoles linear, early deciduous, 4 mm and 1 mm long respectively. *Flowers* creamy white; pedicels 1 mm long. *Calyx* 1-1.5 mm long, 5-toothed, pubescent at first, becoming glabrous or retaining a fringe of hairs. *Corolla* 4.5-5 mm long, 5-lobed; tube glabrous, 2.5-3 mm long; lobes deltoid, 1.5-2 mm long with a tuft of hairs at the apex of each lobe. *Stamens* 1.5-1.8 cm long, united at the base for 3 mm. *Ovary* glabrous, 1.5 mm long, shortly stipitate; style filiform exceeding the stamens in length. *Pod* several seeded, linear to linear-oblong, 12-23 cm long and 2.4-4 cm broad, flat, thin textured, often with transverse striations; margin slightly thickened, straight or indented between the seeds; position of seeds apparent as raised bumps on the valve.

Recorded from Mocambique, Southern Rhodesia, Bechuanaland and the Transvaal.

TRANSSVAAL.—Soutpansberg: Messina, *Moss and Rogers* 66; *Pole Evans* 2527; *Gerstner* 5449; near Messina, *Rogers* 19247a; Dongola area, *Codd* 4459; Zoutpan, *Bremekamp and Schweickerdt* 310; *Verdoorn* 601; *O.S.V.* 170; Masekwapoort, *Codd* 8372; 4 miles N.W. of Wyllie's Poort, *Codd* 2999; Mpefu Location, *Smuts* 2053; Vanetzi Poort, *Gerstner* 6055; 6231; Kruger Nat. Park, near Punda Maria, *Lamont* 5; Lebombo Hills, *Lamont* 20. Pilgrims Rest: Kruger Nat. Park, The Gorge, *Codd* 6188; *van der Schijff* 2323. Waterberg: 11 miles S. of Ellisras, *Codd* 8493; 8831. Brits: Farm Welgevonden, *Mogg* 14641; 7 miles N. of Assen, *Codd* 6566. Rustenburg: Onkuil, *van Nouhuys* 61.

The holotype of *A. brevifolia* was kindly sent to us on loan by the Director of the Botanical Museum, Zurich University, and was compared with an isosyntype of *A. parvifolia* present in the National Herbarium, Pretoria. Both are flowering specimens with immature leaves and are similar in all essentials. When taken into consideration with a good range of modern material, the conclusion is unavoidable that only one species is involved. The type of *A. rogersii* is a fruiting twig with mature leaves. Observations made in the type area of *A. rogersii* and *A. parvifolia*, that is, in the northern Transvaal between Messina and Dongola, combined with the examination of flowering and fruiting specimens collected from individual trees, leave no doubt that the two are conspecific. The leaves of the type material of *A. parvifolia* are so immature that the leaflets can scarcely be distinguished; thus the number of leaflets and their dimensions given by Burt Davy cannot be regarded as representative.

The type locality of *A. brevifolia* is Boruma, on the lower reaches of the Zambesi River in Mocambique, and intermediate localities in Southern Rhodesia form a link with the records from the Transvaal. In the last named region the species is almost invariably associated with hot, dry, rocky hillsides, on geological formations such as sandstone, quartzite or granite. Although often found as a small tree branching from near ground level, it is said to grow to 40 feet tall with a spreading, umbrageous crown. Information on herbarium specimens indicates that the wood is hard and durable and is used for axe and pick handles. According to Lamont (formerly a Ranger in the northern part of the Kruger National Park), the bark, being termite resistant, is stripped and used for tying poles of huts. Notes on characters distinguishing *A. brevifolia* from *A. harveyi* will be found in the discussion on the latter species.

2. *A. amara* (Roxb.) Boiv. subsp. *sericocephala* (Benth.) Brenan in Kew Bull. 1955: 190.

Syntypes: Ethiopia, Kotschy 294; Sennaar, Kotschy 244; Abyssinia, Schimper 818, 883.

A. sericocephala Benth. in Hook. Lond. Journ. Bot. 3: 91 (1844); Milne-Redhead in Kew Bull. 1934: 301; Brenan and Greenw., Ch. List. For. Trees and Shrubs. Tanganyika, 2: 341 (1949).

Acacia sericocephala Fenzl in Flora, 312 (1844), *nomen nudum*.

Inga sericocephala A. Rich., Fl. Abyss. 1: 236 (1847).

Albizzia struthiophylla Milne-Redhead in Kew Bull. 1933: 144.

Type: Northern Rhodesia, Mazabuka, Milne-Redhead 1207 (PRE, iso.).

Tree 4–12 m tall; branchlets persistently pubescent. *Leaves* 10–18 cm long and 3.5–5 cm wide, fulvo-tomentose when young, rusty to grey hispid when mature; petiole 0.8–1.5 cm long; pinnae 15–35 pairs; leaflets 25–42 pairs, linear oblong, 3–3.5 mm long and 0.5–0.75 mm broad, oblique at the base, apex obtuse to rounded, not falcate; midrib nearly central. *Inflorescence* of 12–18 flowers; bracts and bracteoles minute, linear, early deciduous; peduncle 1.5–2 cm long; peduncle and buds fulvo-tomentose. *Flowers* whitish, subsessile. *Calyx* 1.5–2 mm long, 5-toothed, golden tomentose; teeth rounded. *Corolla* 4.5–5 mm long, 5-lobed, golden tomentose, especially on the lobes; lobes ovate deltoid, 2–2.5 mm long. *Stamens* 1.2–1.4 cm long, united at the base for 2–2.5 mm. *Ovary* glabrous, 2–2.5 mm long, shortly stipitate; style filiform, slightly exceeding the stamens in length. *Pod* several seeded, linear to linear oblong, 12–28 cm long and 2.8–4 cm wide, flat, thin textured, with occasional transverse striations; margin slightly thickened, straight or occasionally indented between the seeds; position of seeds apparent as raised bumps on the valves.

Recorded from Anglo-Egyptian Sudan and Eritrea, through tropical East Africa and the Rhodesias to Bechuanaland and north-eastern Transvaal.

TRANSVAAL.—Soutpansberg: Nuanetsi Drift, *Smuts* s.n.; Sibasa area, *van Warmelo* 5115/24; 24 miles N.E. of Sibasa, *Codd* 6901; 17 miles E. of Sibasa, *Codd and Dyer* 4494; Shingwedzi River, *Forest Officer*, Pietersburg, s.n.; Minga, near Punda Maria, *Gerstner* 6219; Kruger National Park, near Punda Maria, *van der Schijff* 986; between Shangoni and Punda Maria, *van der Schijff* 2894.

Baker (1930) places *A. sericocephala* Benth. as a synonym of *A. amara* (Roxb.) Boiv. It was upheld again as a distinct species by Milne-Redhead (1934), but Brenan (1955) takes an intermediate course and gives it the status of a subspecies of *A. amara*. According to the latter author, specimens referable to the subsp. *amara* are also to be found in East Tropical Africa, though this subspecies has its main distribution in Asia. *A. struthiophylla* has been regarded for some time as being hardly separable from *A. sericocephala*, a view confirmed by Brenan, l.c.

Within our region, *A. amara* subsp. *sericocephala* has been found only in the north eastern corner of the Transvaal, on sandy flats, mainly in the area between Sibasa and Punda Maria. This area receives a slightly higher rainfall than the typical lowveld to the south, north and east, where the somewhat similar species *A. harveyi* occurs. It may be readily distinguished from *A. harveyi* by its longer leaves, more numerous pinnae and pinnules, and by the apex of the leaflet not being distinctly acute and curved. In stature it resembles *A. harveyi*, being a small tree usually with a single main trunk and a relatively narrow crown.

3. *A. harveyi* Fourn. in Bull. Soc. Bot. Fr. 12: 399 (1865); Bak. f. Leg. Trop. Afr. 865 (1930); Burt Davy, l.c. 348 (1932); Brenan and Greenw., l.c. 341 (1949); Codd, l.c. 56 (1951).

Type: Bechuanaland, banks of the Chobe, Lake Ngami and adjoining forests. *J. McCabe* (K, holo.).

A. pallida Harv. in Fl. Cap. 2: 284 (1861/62), non Fourn.

Type: As above.

A. hypoleuca Oliv. in Fl. Trop. Afr. 2: 356 (1871).

Type: As above.

Tree 5–10 m tall, usually with a distinct main trunk; bark grey; branchlets pubescent. *Leaves* 7–12 cm long and 4–5.5 cm wide; young parts fulvous; rachis persistently strigose pubescent; petiole 1–2 cm long; pinnae 8–18 pairs; leaflets 12–24 pairs, discolorous, pubescent when young, becoming glabrescent with age, linear oblong, 3–6 mm long and 1–1.5 mm broad, oblique at the base, apex acute, falcate; midrib distinctly nearer the upper margin. *Inflorescence* of 10–15 flowers; buds fulvo-tomentose; peduncle 1.5–3 cm long, hispid; bracts and bracteoles linear, 3 mm and 1.5 mm long respectively, hispid, persisting to the flowering stage. *Flowers* creamy white, subsessile. *Calyx* 2–2.5 mm long, 5-lobed, fulvous; lobes deltoid, 0.5 mm long. *Corolla* 5–5.5 mm long, 5-lobed, pubescent; tube 3 mm long; lobes ovate, 2–2.5 mm long. *Stamens* 1.3–1.6 cm long, united at the base for 2.5 mm. *Ovary* puberulous, 2 mm long, very shortly stipitate; style filiform, exceeding the stamens in length. *Pod* several seeded, linear to linear-oblong, 6–12 cm long and 1.8–2.8 cm wide, flat, thin textured, sometimes with transverse striations; margin slightly thickened, straight or slightly indented between the seeds; position of seeds apparent as raised bumps on the valve.

Distributed from Tanganyika through Nyasaland and the Rhodesias to the Caprivi Strip, Bechuanaland, Mocambique, Transvaal and into Swaziland.

SOUTH WEST AFRICA.—Caprivi Strip: Katima Mulilo, *West* 3249.

TRANSVAAL.—Soutpansberg: *Smuts* s.n.; Messina, *Pole Evans* 1440; Dongola Reserve, Krematfontein, *Pole Evans* 3526; 5½ miles N. of Alldays, *Codd* 4053; 4460; near Wyllie's Poort, *Pole Evans* 2047; Kruger National Park, Punda Maria, *Lang* in TM 32251; *Codd* 4223; Mabaza, *Lang* in TM 32248. Pietersburg: Blaauwberg, on flats at base of mountain, *Leeman* 51. Waterberg: 20 miles E. of Ellisras, *Acocks* 8820. Letaba: Kruger National Park, Letaba area, *Lang* in TM 30357; 30862; *van der Schijff* 623. Nelspruit: Kruger National Park, near Skukuza Camp, *Letty* 57; 12½ miles N.E. of Malelane, *Codd* 5218; Malelane, *Thorncroft* 3111. Barberton: near Hectorspruit, *Burt Davy* 8004; Komatipoort, *Schlechter* 11875 (GRA); *Rogers* 22246.

SWAZILAND.—Near Makombo, *Miller* S/15.

Vegetative specimens of *A. harveyi* are sometimes confused in the herbarium with *A. brevifolia* but the two may be distinguished by the shape of the apex of the leaflet which, in *A. harveyi*, is acute and distinctly falcate, while in *A. brevifolia* it is obtuse or rounded and almost straight. In ecology the two are distinct as *A. harveyi* is found mainly on the flat, dry bush country of the Limpopo valley and the eastern Transvaal Lowveld, where it is a common constituent of the vegetation of the Kruger National Park.

4. *A. forbesii* Benth. in Hook. Lond. Journ. Bot. 3: 92 (1844); Harv. in Fl. Cap. 2: 284 (1861–62); Benth. in Trans. Linn. Soc. 30: 568 (1875); Burt Davy, l.c. 348 (1932); *Codd*, l.c. 54 (1951).

Type: Mocambique, Delagoa Bay, *Forbes* s.n. (K, holo.).

Tree 8–20 m tall, often branching from near the base with spreading, drooping branches, making an extensive crown; branchlets pubescent. *Leaves* 6–10 cm long and 5–6 cm wide, frequently folded along the midrib, hispid; pinnae 2–7 pairs; leaflets 6–14 pairs, oblong, 5–6 mm long and 2–3 mm broad, oblique at the base, apex obtuse to acute, oblique to slightly falcate, often mucronate; midrib distinctly nearer one margin; margin of leaflet inrolled. *Inflorescence* of 10–15 flowers; buds fulvo-tomentose; peduncle 2–3 cm long, hispid; bracts and bracteoles linear, 3 mm and 1.5 mm respectively, early deciduous. *Flowers* creamy white, sessile. *Calyx* 3–3.5 mm long, 5-toothed, fulvous. *Corolla* 6–7 mm long, 5-lobed, fulvous; tube 4–4.5 mm long, subcylindrical, widening towards the throat; lobes ovate, 2–2.5 mm long. *Stamens* 1.3–1.5 cm long, united at the base for 2.5–3 mm. *Ovary* glabrous, 2–3 mm long, shortly stipitate; style filiform exceeding the stamens in length. *Pod* several seeded, oblong to linear-oblong, 8–15 cm long and 3.5–5 cm broad, flat, fibrous, with marked transverse striations; margin thickened, straight; position of seeds not apparent.

Recorded from the eastern Transvaal lowveld, Mocambique and northern Zululand.

TRANSVAAL.—Soutpansberg: Kruger National Park, near Punda Maria, *Rowland Jones* 29. Nelspruit: Kruger National Park, Lower Sabie Road, *Codd* 5497; 5704; *van der Schijff* 3265; 3412; near Malelane, *van der Schijff* 1417. Barberton: Komatipoort, *Pole Evans* H16861.

NATAL.—Zululand, without locality, *Gerstner* 4943. Ingwavuma: Mangusi Forest, *Gerstner* 4076 (NH); Maputo Forest, *Gerstner* 4115. Ubombo: Schreiber's farm, *Gerstner* 5562; Mkuzi Game Reserve, *Ward* 2641.

This is a distinctive species with a limited distribution. Although not generally common, it is sometimes gregarious, occurring in local groups, especially on or near river banks. Under favourable conditions it grows to a tall tree with a large, spreading, twiggy crown, usually with somewhat drooping branches.

5. *A. versicolor* Welw. ex Oliv. in Fl. Trop. Afr. 2: 359 (1871); Bak. f., l.c. 863 (1930); Burtt Davy, l.c. 348 (1932); Brenan and Greenw., l.c. 343 (1949); Codd, l.c. 57 (1951).

Syntypes: Angola, Golungo Alto and Zenza do Golungo, *Welwitsch*, and Nyasaland, Maravi Country west of Lake Nyasa, *Kirk* (all at BM).

Var. *mossambicensis* Schinz in Bull. Herb. Boiss. ser. 2, 2: 946 (1902); Bak. f., l.c. 863 (1930).

Type: Mocambique, Zambesi area, Boruma, *Menyharth* 77b (Z, holo.).

A. mossambicensis Sim, For. Fl. P.E.A. 59, t. 60 (1909).

Type: Mocambique, Umbelusi, *Sim* 6392 (NU, holo.).

Tree 6–18 m tall with a single main trunk and a large, round or spreading crown; bark grey; branchlets persistently tomentose. Leaves 18–30 cm long and 12–24 cm broad, rusty pubescent; petiole 3–6 cm long; pinnae 1–3 pairs; leaflets 3–5 pairs, oblong to obovate-oblong or broadly elliptical, 3–5.5 cm long and 1.5–3 cm broad, oblique at the base, apex rounded to truncate, often mucronulate. Inflorescence 18–25 flowered; peduncle 4–5.5 cm long, fulvo-tomentose. Flowers creamy white, sessile. Calyx 5.5–6.5 mm long, 5-toothed, fulvo-tomentose; teeth deltoid, 1.5 mm long. Corolla 7–8 mm long, 5-lobed, tomentose; tube 3.5–4 mm long; lobes ovate, 3.5–4 mm long. Stamens 2.8–3.5 cm long, united at the base for 3 mm. Ovary puberulous, 3 mm long, subsessile; style filiform, slightly exceeding the stamens in length. Pod several seeded, linear to linear-oblong, 8–22 cm long and 3–5.5 cm wide, flat, thin textured with some transverse striations; margin thickened, straight or slightly indented between seeds; position of seeds apparent as raised bumps on the valves.

Recorded from Uganda southwards to Angola, South West Africa, Bechuanaland, the Rhodesias, Mocambique, Transvaal, Swaziland and Zululand.

SOUTH WEST AFRICA.—Ovamboland: Oshikongo, *Loeb* 20; 431; *Rodin* 2609 (BOL). Okavango: Runtu, *Maguire* 1595; Popa Falls, *Maguire* 1665. Caprivi Strip: *Curson* 940.

TRANSVAAL.—Soutpansberg: Messina, *Pole Evans* 2040; Soutpansberg Range, *Smuts* s.n.; Soutpan, *Galpin* 15128; Elim, *Obermeyer* 564; Makonde, *Westphal* in TM 29123; 4 miles S.E. of Sibasa, *Codd and Dyer* 4491; Kruger National Park, Punda Maria, *Lang* in TM 32301; *Codd and Dyer* 4615; *Rowland Jones* 14. Pietersburg: *Smuts* s.n.; Letaba: Thabina, *Burtt Davy* 2893; *Swierstra* 2188. Lydenburg: Buffelsvlei, *Codd* 6674. Pilgrims Rest: *Oranje* 4453; Acorn Hoek, *Keet* 1488; Bushbuckridge, *Pritchard* 28; *Acocks* 12894; Lothian, *Forest Dept.* 6836. Nelspruit: *Legat* in Hb. *Burtt Davy* 2830; Kruger National Park, near Pretorius Kop, *Codd* 5694; *Rowland Jones* s.n.; *van der Schijff* 151; 431; 727. Barberton: *C. A. Smith* 7072; Malelane, *Pole Evans* H 15771; Queens River Valley, *Galpin* 651; Sheba Valley, *Thorncroft* 3019.

SWAZILAND.—Ingwavuma River, *West* 2105.

NATAL.—Zululand, without locality: *Wylie* 8805; *Boocock* 4; *Gerstner* 5086. Ubombo: Otobotini, *McClean* in NH 18473 (NH). Hlabisa: *Gerstner* 2944 (NH); Dukuduku Reserve, *Stephens* 97 (NH); Hluhluwe Game Reserve, *Ward* 1861 (NH); *van Zinderen Bakker* 111 (NH); *Bayer* in NU 7113 (NU). Lower Umfolosi: Near Ngondo Siding, *Acocks* 12976; Umhlatuzi Valley, *Lawn* 2118a (NH); Entonjaneni: Near Melmoth Road, *Lawn* 1392 (NH). Eshowe: Between Eshowe and Nkandhla, *Pole Evans* 3622. Mtunzini: Gingindhlovu, *Wylie* in NH 9243 (NH); 4 miles N. of Gingindhlovu, *Lawn* 1864 (NH); Amatikulu, *Wood* 7589.

The type of var. *mossambicensis* Schinz has not been seen. The slight deviations in corolla length and pubescence do not appear to justify its separation even as a variety, nor does an examination of a good range of modern material indicate that this variable species should be split up into groups of minor rank. The type of *A. mossambicensis* Sim is cited as No. 6392. The holotype is in the Natal University Herbarium and was sent on loan by Professor A. W. Bayer. It is actually annotated by Sim as *A. umbelusiensis* (sic), but obviously agrees with his description and plate of *A. mossambicensis* and not with his published *A. umbalusiensis* (see notes under *A. anthelmintica* and *A. evansii*). In all respects the type of *A. mossambicensis* falls within the range of variation accepted for *A. versicolor*.

A. versicolor grows to an attractive large tree with a round crown of graceful foliage. A useful timber is obtained from the tree and is known commercially in South Africa as Umvangaas. This is an unfortunate choice as it is the name used in the Swazi and Shangaan languages for the Kiaat (*Pterocarpus angolensis*) which produces a very similar timber. The Swazi name for *A. versicolor* is siVangatsane, or "Little Kiaat". Sim unaccountably states that its timber is useless. Brenan and Greenway, in addition to recording that the timber is used, state that the natives make a soapy substance from the roots and that the roots are employed as an anthelmintic and also as a purgative and enema.

6. *A. antunesiana* Harms in Engl. Bot. Jahrb. 30: 75 (1901); Bak. f., l.c. 861 (1930); Brenan and Greenw., l.c. 342 (1949).

Syntypes: Angola, Huilla, *Antunes* 330, and Nyasaland, Unyika, *Goetze* 1372.

Tree 3-12 m tall; bark grey, rough; young parts pubescent, becoming glabrous with age. *Leaves* 12-25 cm long, and 10-20 cm wide, sparingly pubescent when young, soon becoming glabrous; petiole 4-6 cm long; pinnae 1-3 pairs; leaflets 5-9 pairs, ovate-oblong to trapeziform, 2.5-6 cm long and 0.8-2.8 cm broad, more or less coriaceous, discolorous, oblique at the base, apex rounded. *Inflorescence* of 15-20 flowers, the central flower usually larger than the rest; buds rusty pubescent; peduncle 4-5 cm long, rusty pubescent; bracts and bracteoles small, linear, early deciduous. *Flowers* creamy white; pedicel up to 1 mm long; central flower larger and purely male. *Calyx* 4.5-5 mm long, 5-toothed, narrowing to the base, rusty pubescent. *Corolla* 7-8 mm long, 5-lobed, rusty pubescent, paler than the calyx; tube 3.5-4 mm long; lobes 3.5-4 mm long, ovate oblong, margin inrolled. *Stamens* 2.4-2.8 cm long, united at the base for 4-5 mm. *Ovary* glabrous, 2 mm long, shortly stipitate; style filiform, shorter than the stamens. *Pod* several seeded, linear oblong, 11-16 cm long and 2.5-4 cm broad, flat, thintextured; margin slightly thickened, scarcely indented between the seeds; position of seeds apparent as bumps on the valve.

Recorded from the Belgian Congo, Tanganyika, the Rhodesias, Mocambique, Angola and northern South West Africa.

SOUTH WEST AFRICA.—Okavango: *de Winter and Wiss* 4394. Caprivi Strip: opposite Andara, *de Winter and Marais* 4816.

A. antunesiana is closely related to *A. coriaria* Welw. In the absence of authentic material of either species in South African herbaria, I accept the opinion of Mr. D. J. B. Killick, who considers that the two are distinct. He states that *A. antunesiana* has longer leaflets which are more oblique at the base, while the leaf rhachis is always glabrous. *A. coriaria* sometimes has completely glabrous leaflets, but the rhachis always shows some pubescence.

7. *A. tanganyicensis* Bak. f. in Journ. Bot. 67: 199 (1929); Leg. Trop. Afr. 862 (1930); Brenan and Greenw., l.c. 342 (1949).

Type: Tanganyika Territory, Kondowe District, Simbo Hills, *B. D. Burtt* 716 (K, holo., EA, iso.!).

A. rhodesica Burt Davy, Fl. Tvl. 2: xviii and 348 (1932); Codd, l.c. 56 (1951).

Syntypes: Southern Rhodesia, Matopos, *Galpin* 7082 (PRE, isosyn.) and Victoria Falls, *Allen* 174; *Rogers* 5319.

A. lebbek var. *australis* Burtt Davy in Burtt Davy and Hoyle, Ch. List Trees and Shrubs Nyasaland Prot. 53 (1936), *nomen nudum*.

Tree 3–8 m tall, sparingly branched; branches ascending; bark smooth, white to light brown, peeling in broad, papery strips; twigs sparingly pubescent, usually becoming glabrous or nearly so. *Leaves* 25–40 cm long and 20–30 cm broad, sparingly pubescent, especially when young; petiole 5–10 cm long; pinnae 2–5 pairs; leaflets 5–12 pairs, oblong, broadly elliptical to ovate oblong, 2–4 cm long and 1–2.2 cm broad, oblique at the base, apex rounded to obtuse. *Inflorescence* of 20–25 flowers; peduncle 3–4 cm long; peduncle and buds rusty hispid; bracts and bracteoles small, linear, early deciduous. *Flowers* creamy white, subsessile. *Calyx* 4.5–5.5 mm long, 5-lobed, fulvous; lobes ovate-deltoid, 1.5–2 mm long. *Corolla* 7–9 mm long, 5-lobed; tube usually pubescent, 4–5 mm long; lobes ovate to ovate-lanceolate, 3–3.5 mm long, fulvo-tomentose, especially towards the apex. *Stamens* 2.5–3 cm long, united at the base for about 4 mm. *Ovary* glabrous, 3 mm long, shortly stipitate; style filiform, exceeding the stamens in length. *Pod* several seeded, flat, semi-woody, smooth, linear to linear-oblong, 15–25 cm long and 3–5 cm broad, light brown; margin scarcely thickened; position of seeds usually not visible through valves.

Recorded from Tanganyika, Nyasaland, Rhodesia and the Transvaal.

TRANSVAAL.—Soutpansberg: *Menne* s.n.; Kruger National Park, near Punda Maria, *Lamont* s.n.; *Codd and Dyer* 4549. Waterberg: Near Nylstroom, *Pole Evans* H19679; *Codd* 5601; *Repton* 3472; *Prosser* 1722; 19 miles E. of Vaalwater, *Codd* 986; Leopards Kloof, Hartebeestelaagte, *Galpin* 13391; Rooiberg, *Pole Evans* s.n.; hills near Warmbaths, *Burtt Davy* 2183; *Bolus* 11868; *Gerstner* 5278; *Story* 1522.

The probability that *A. rhodesica* would prove to be a synonym of *A. tanganyicensis* was recognised by Mr. B. de Winter while at Kew Herbarium as our liaison officer. This view was supported after seeing an isotype of *A. tanganyicensis* kindly sent to us on loan from the East African Herbarium, Nairobi, and comparing it with material in the National Herbarium.

The name *A. lebbek* var. *australis* is listed by Burtt Davy and Hoyle without description or citation of specimens. A clue to its identity is provided by the fact that several sheets in the National Herbarium, Pretoria, are annotated by Burtt Davy with this name, including *Galpin* 7082, one of the syntypes of his *A. rhodesica*.

There has been some confusion in the past between *A. tanganyicensis* Bak. f. and *A. lebbeck* (L.) Benth., but the two are clearly distinct. Vegetative specimens of the two are very similar, though *A. tanganyicensis* has more closely placed and more numerous leaflets (5–12 pairs), as against 3–9 pairs of leaflets for *A. lebbeck*. In *A. tanganyicensis* the individual flowers are subsessile, the calyx is relatively long (4.5–5.5 mm) and is 5-lobed, with a marked golden brown tomentum, especially towards the apex, as well as on the lobes of the corolla. In *A. lebbeck* the flowers have pedicels 2–3.5 mm long, the calyx is 4–4.5 mm long, is shortly 5-toothed, with a short, pale brown tomentum, while the corolla is almost glabrous with a few whitish hairs on the lobes. There are other differences, including a marked distinction in ecology and habit. *A. tanganyicensis* is a small deciduous tree inhabiting rock formations with

an acid reaction, such as granite or quartzite. It is sometimes sparingly branched near the base, with few, ascending or crooked branches, forming a sparse canopy. The most striking feature, however, is the bark, which is thin and light brown in colour, peeling off in broad, papery flakes, leaving a white smooth surface. It has no timber value and farmers in the Transvaal have remarked that, when the wood is worked, the dust is a strong irritant to the nose and throat, so that it is locally known as "sneeze-wood".

8. *A. suluensis* Gerstner in Journ. S. Afr. Bot. 13: 62 (1947).

Lectotype: Natal, Melmoth District, 2 miles west of Dundulu Store, Gerstner 4337 (PRE).

Tree 5-15 m tall with a round or spreading crown; bark grey, fissured; young twigs usually pubescent, soon becoming glabrous. Leaves 13-20 cm long and equally broad; petiole 2-5 cm long; pinnae 2-4 pairs; leaflets 5-9 pairs, glabrous to sparingly pubescent, especially on the petiolule, dark green above, underside paler, broadly elliptical to oblong or obovate, 2-2.5 cm long and 1-1.5 cm broad, oblique at the base, apex rounded to truncate, mucronate; margin crisped. Inflorescence of 20-25 flowers; peduncle 3-4 cm long; peduncle and buds fulvo-tomentose. Flowers whitish, subsessile. Calyx 5-toothed, 2.5-3.5 mm long, fulvo-tomentose; teeth rounded. Corolla 5-6 mm long, 5-lobed, fulvo-tomentose; tube 3-3.5 mm long; lobes lanceolate, 3 mm long. Stamens 1.3-1.6 cm long, united at the base for 5-6 mm. Ovary glabrous, 2-3 mm long, shortly stipitate; style filiform, equal to the stamens in length. Pod several seeded, linear to linear-oblong, 8-16 cm long and 1.4-2.6 cm broad, flat, light brown, thin textured with occasional transverse striations; margin slightly thickened, straight or indented between the seeds; position of seeds apparent as raised bumps on the valves.

Distribution confined to northern Zululand.

NATAL.—Hlabisa: Gerstner 1714 (NBG); 1730 (NBG); 4601 (NH); 6440; 6440a (NH); 6440b (NH); Nhlwati, F. Bayer 64; Gerstner 730; Dukumbane, Gerstner 714; Gwegwede River, Gerstner 6261 (BOL); Mtadhlwana Hill, F. Bayer 14/46; 4 miles N. of Hlabisa, Codd 9611; Hluhluwe Game Reserve, Ward 2829 (NH). Melmoth: 2 miles W. of Dundulu Store, Gerstner 4337, (PRE, lecto.).

In choosing one of the National Herbarium specimens as the lectotype, I was influenced by the fact that the preliminary examination leading to the recognition of this as an undescribed species was carried out by Miss I. C. Verdoorn, who had before her a good range of material collected by the Rev. Fr. Gerstner and Mr. F. Bayer, including specimens in better condition than those cited with the published description. In the selection of a lectotype, however, one is limited to the material cited by the author. Of the syntypes listed by Gerstner, two are represented in the National Herbarium, namely, Gerstner 4337 (flowering) and Bayer 64 (fruiting). Although he cites his No. 4601 as being present in PRE, this does not appear to be the case. Because flowers and leaflets are the most diagnostic characters of the species, Gerstner 4337 is chosen as the lectotype. The leaf illustrated with Gerstner's type description is obviously from his No. 4601, which is an immature specimen with leaflets mainly acute. This is not representative of mature specimens, in which the leaflets are rounded to truncate at the apex, with the margins distinctly crisped. The drawing of the flower also conveys the wrong impression through showing the calyx distinctly lobed when in fact it is very shortly toothed.

A. suluensis is a graceful tree with a round crown, bearing some resemblance to *A. lebbeck* but can readily be distinguished from that species by the crisped margin of the leaflet, by the golden tomentum of the calyx and corolla and by several other features. It appears to be endemic in northern Zululand, having been collected only from the Hlabisa and Melmoth Districts.

Gerstner records that the natives pound the bark with water, producing a foaming mixture which is used as a powerful enema. The timber is said to be hard and durable with an attractive grain, suitable for furniture. It is also stated that the sawdust produced while working the timber is somewhat irritant and causes sneezing.

9. *A. anthelmintica* (*A. Rich.*) *A. Brongn.* in Bull. Soc. Bot. Fr. 7: 902 (1860); Oliv. in Fl. Trop. Afr. 2: 357 (1871); Benth. in Trans. Linn. Soc. 30: 564 (1875); Marloth, Fl. S. Afr. II, 1: t. 29 (1925); Bak. f., l.c. 859 (1930); Brenan and Greenw., l.c. 341 (1949); Codd, l.c. 53 (1951).

Type: Abyssinia, near Add'erbati, *Quartin Dillon*.

Var. *australis* Bak. f., l.c. 859 (1930).

Type: South West Africa, Okahandja, *Dinter* 269 (K, holo., PRE, iso.).

Var. *pubescens* Burt Davy, l.c. xvii (1932).

Syntypes: Transvaal, Soutpansberg District, Waterpoort, *Rogers* 19347 (PRE, isosyn.) and *Rogers* 21504 (PRE, isosyn.).

Besenna anthelmintica *A. Rich.*, Fl. Abyss. 1: 253 (1847).

Acacia marlothii Engl. in Engl. Bot. Jahrb. 10: 19 (1889).

Type: South West Africa, near Otjimbingwe, *Marloth* 1317 (B, holo., destroyed; PRE, iso.).

Albizzia umbalusiana Sim, For. Fl. P.E.A. 59, t. 55A (1909).

Type: Mocambique, Umbeluzi, *Sim* 6200 (apparently no material extant).

Shrub or small tree 2–10 m tall; branchlets twiggy, usually with lenticular bark, often forming abbreviated, spine-tipped shoots; young twigs usually sparingly pubescent, soon becoming glabrous. *Leaves* 6–8 cm long and 5–6 cm broad; rhachis glabrous to sparingly hispidulous; petiole 0.5–2 cm long; pinnae 2–4 pairs; leaflets 2–5 pairs, the uppermost usually the largest, glabrous above, glabrous or sparingly pubescent on the nerves below, obovate, broadly elliptical to subrotundate or ovate, 0.8–2.5 cm long and 0.5–1.8 cm broad, oblique at the base, apex obtuse, mucronulate. *Inflorescence* of 15–25 flowers; peduncle 1.4–2 cm long, often sparingly pubescent; bracts and bracteoles small, early deciduous. *Flowers* white to cream; pedicels 1–2.5 mm long. *Calyx* 3–4.5 mm long, 5-toothed, deeply cleft on one side, usually glabrous except for occasionally a tuft of white hairs at the apex of each tooth. *Corolla* 6–9 mm long, 5-lobed, glabrous except for a tuft of white hairs at the apex of each lobe; tube 3–5 mm long; lobes ovate-lanceolate, 3–4 mm long. *Stamens* 2.3–2.8 cm long, united at the base for 3–4 mm. *Ovary* glabrous, about 3 mm long, shortly stipitate; style filiform, exceeding the stamens in length. *Pod* several seeded, linear to linear-oblong, 8–12 cm long and 2–2.5 cm broad, flat, membranous, straw coloured to light brown with occasional transverse striations; margin slightly thickened, straight or indented between the seeds; position of seeds apparent as raised bumps on the valves.

Recorded from Abyssinia, through tropical East Africa and the Rhodesias to Angola, South West Africa, Bechuanaland, Mocambique, Transvaal and Natal.

SOUTH WEST AFRICA.—Ovamboland: near Oshikanga, *Rodin* 2673. Okavango: Runtu, *Maguire* 1615 (NBG). Grootfontein: *Watt and Brandwijk* 1443; Tsumeb, *Basson* 15; Schaap River Hills, *Keet* 1504; 20 miles S. of Osiri, *Liebenberg* 4682. Otjiwarongo: Waterberg, *Liebenberg* 4774. Okahandja: *Dinter* 269 (PRE, SAM, GRA); *Bradfield* 452. Gobabis: *Liebenberg* 4628. Windhoek: *Dinter* s.n.; *Keet* 1674; *Codd* 5793; Otjisewa, *Wiss and Kinges* 739. Rehoboth: Buellspoort, *Strey* 2187. Maltahoehe: Kleinfontein, *Marloth* 5052. Keetmanshoop: *Rogers* s.n. (GRA); Gellap Ost, *Acocks* 15608.

TRANSVAAL.—Soutpansberg: Dongola area, *Pole Evans* 3534; *Codd* 4331; near Messina, *Rogers* 19347; *Pole Evans* H18897; *Gerstner* 5453; Waterpoort, *Rogers* 21504; *Gerstner* 5718; Masekwapoort, *Gerstner* 5953; Sibasa area, *Gerstner* 6213; Kruger National Park, Makuleka, *Lang* in TM 32263; Pafuri, *van der Schijff* 642. Pietersburg: *Smuts* s.n.; Leipzig Mission, Blaauwberg, *Leipolt* 3; near Malipsdrift, *Erens* s.n.; *Repton* 699. Waterberg: 30 miles N.W. of Vaalwater, *Smuts* 361. Rustenburg: near Matlabas, *Acocks* 8802. Lydenburg: *Barnard* 49a; 49b; 4 miles N. of Buffelsvlei, *Codd* 6675. Pilgrims Rest: Kruger National Park: Sand River, *van der Schijff* 775. Nelspruit: Kruger National Park, near Skukuza, *Lang* in TM 30866; *Letty* 67; *Codd* 5701; *van der Schijff* 747; 783. Barberton: near Louws Creek, *Acocks* 12879; *Codd* 1040.

NATAL.—Zululand, without locality, *Gerstner* 4944; 5088. Ingwavuma: *Gerstner* 3767 (NH); near Pongola, *West* 2093 (NH); Otobotini, *Gerstner* 3431 (NH). Ubombo: Mkuzi, *Galpin* 13691. Hlabisa: Hluhluwe Game Reserve, *Ward* 1440 (NU). Lower Umfolosi: near Umhlatuzi River, *Gerstner* 6441 (NH).

In South Africa and in drier parts of the tropics, *A. anthelmintica* is a small tree or shrub up to about 15 feet tall. According to the Flora of Tropical Africa, it may reach the stature of a large tree from the trunks of which native canoes are made, but this statement requires confirmation. The southern form has been separated variately by both Baker fil. and Burtt Davy. There seems little justification for this course, a view also expressed by Mr. Brenan and Mr. Killick after the examination of a wide range of specimens, including type material. Specimens matching the southern form can be found from north tropical Africa, while pubescence is not restricted to the South African specimens. Dr. P. J. Greenway of Nairobi informs me that he knows the species in the field almost throughout its whole range from the Kruger National Park to the Kenya—Ethiopian boundary and can see no evidence to support the separation of a variety.

The holotype of *Acacia marlothii* Engl., *Marloth* 1317, presumed to have been in Berlin-Dahlem Herbarium, appears to have been destroyed, but a specimen of this number is in the National Herbarium, Pretoria. It is a sterile twig but is unmistakably conspecific with *Albizia anthelmintica*.

There is some evidence that Sim based his *A. umbalusiana* on a mixture. The flowering twig with spine-tipped branchlets illustrated on Plate 55A of his Forest Flora of Portuguese East Africa would pass as *A. anthelmintica*, though the leaf and pod show a closer resemblance to *A. evansii*. No material of the type, Sim 6200, has been traced. The greater part of Sim's phanerogamic collection is in the Natal University Herbarium, but No. 6200 is not represented. Two specimens have been annotated by him with the name *A. umbelusiana* (sic). One of these is No. 6392, the type of *A. mossambicensis* Sim (see note under *A. versicolor*); the other, No. 23118, a fruiting specimen, is identifiable as *A. evansii* Burtt Davy, a species with very different flowers from those described and illustrated as *A. umbalusiana*. It seems probable that the leaf and pod of Plate 55A were drawn from this specimen, in which case the flowering twig with spine-tipped branchlets (excluding the leaf) no doubt corresponds to the missing type, No. 6200. It may be noted that Sim also lists *A. anthelmintica*, but gives the description in inverted commas after Dr. Meller, indicating that he was not familiar with the species.

The anthelmintic properties of the roots of this species are recognised by a number of native tribes. Watt and Brandwijk report the presence of sapogenins in the roots but state that these substances are not responsible for the anthelmintic action. Tests with pollen carried out by the Division of Veterinary Services, Onderstepoort, showed that it acts as an irritant to the eyes.

10. *A. evansii* Burt Davy, Fl. Tvl. 2: xvii and 349 (1932). Codd, l.c. 54 (1951).

Type: Transvaal, Nelspruit District, Sabie Game Reserve, *Pole Evans* H16921 (K, holo.).

Shrub or small tree 4–8 m tall, usually branching freely from the base with many ascending branches; branchlets pubescent, not forming abbreviated spine-tipped shoots. *Leaves* 5–8 cm long and 4–6 cm broad; petiole 0.8–2 cm long; petiole and rhachis hispidulous; pinnae 2–4 pairs; leaflets 2–5 pairs, obovate to trapeziform-elliptical, 1–2 cm long and 0.5–1 cm broad, upper surface dark green with a few scattered hairs, lower surface paler, hispidulous; base cuneate, usually oblique, apex obtuse, often mucronulate. *Inflorescence* 6–15 flowered; peduncle 0.8–1.5 cm long, hispidulous; bracts and bracteoles minute, early deciduous. *Flowers* whitish, tinged with red; pedicels 1.5 mm long. *Calyx* 1–1.5 mm long, cup-shaped, obscurely 5-toothed, puberulous. *Corolla* 6–7 mm long, 5-lobed, glabrous or sparsely pubescent on the lobes; tube subcylindrical, widening slightly towards the throat, 3.5–4 mm long; lobes 2.5–3 mm long, ovate-lanceolate, cucullate. *Stamens* 1.6–1.8 cm long, united in a narrow tube for 1.2–1.3 cm. *Ovary* glabrous, 2.5 mm long, shortly stipitate; style filiform, exceeding the anthers by 3–5 mm. *Pod* several seeded, linear-oblong, 6–13 cm long and 1.4–2 cm broad, flat, semi-woody, smooth, yellow brown; margin very slightly thickened, usually straight; position of seeds not apparent through the valves.

Recorded from the north-eastern and eastern Transvaal, southern Mocambique and northern Zululand.

TRANSVAAL.—Soutpansberg: Kruger National Park, 2 miles S. of Punda Maria, *Codd* 5990. Pilgrims Rest: 15 miles S. of Satara, *Codd* 4296; 20 miles N.E. of Skukuza, *Codd* 5592. Nelspruit: Kruger National Park, 16½ miles E. of Skukuza, *Codd* 5706; 5½ miles S.W. of Lower Sabie Camp, *Codd* 5708.

NATAL.—Ingwavuma: *Gerstner* 3734; Ndumu Game Reserve, *Gerstner* 3440; 3993; *Ward* 2037.

Attention has been drawn (page 78) to the possibility that the description and illustration of *A. umbalusiana* Sim are drawn from the two species *A. anthelmintica* and *A. evansii* and that possibly *Sim* 23118 is the basis of the leaf and pod of his Plate 55A. Sim also records the native name Nala for his species and this is the Shangaan name for *A. evansii* encountered in the Kruger National Park. However, the description of the flowers of *A. umbalusiana* could not apply to *A. evansii*.

There is a superficial resemblance between the leaves of *A. anthelmintica* and of *A. evansii*, but the leaflets of the latter are hispidulous, especially on the under surface, while those of *A. anthelmintica* are glabrous or with a few scattered hairs on the nerves, and only very rarely hispidulous in some South West African specimens. *A. evansii* is closely related to *A. petersiana* Bolle but the leaflets of the latter species are more numerous and glabrous, while the corolla and stamens are longer. The habit of *A. petersiana* is not known, but *A. evansii* has a very characteristic appearance, unlike any other South African species. It branches freely from near ground level, forming numerous ascending branches 12–25 feet tall (see *Trees and Shrubs of the Kruger National Park*, Fig. 47). Although never very common, it is sometimes locally gregarious on brakish, sandy flats as, for example, near the Lion Pan in the Kruger National Park.

11. *A. adianthifolia* (Schumach.) W. F. Wight in U.S. Dept. Agr. Bull. 137: 12 (1909); Brenan in Kew Bull. 1952: 520.

Type: Gold Coast, Bliquisso, *Thonning* s.n. (Hb. Haun., Univ. Bot. Mus., Copenhagen, holo.).

Mimosa adianthifolia Schumach. in Schumach. et Thonn., *Beskrif. Guin.* Pl. 322 (1827).

Zygia fastigiata E. Mey. Comm. Pl. Afr. Austr. 165 (1836); Benth. in Hook. Lond. Journ. Bot. 3: 93 (1844); Harv. in Fl. Cap. 2: 285 (1861–62).

Syntypes: Natal, between Umzimkulu and Umkomaas, *Drege*, and Port Natal, *Drege*.

A. fastigiata (E. Mey.) Oliv. in Fl. Trop. Afr. 2: 361 (1871); Benth. in Trans. Linn. Soc. 30: 570 (1875), *pro parte*; Wood and Evans, Natal Pl. 1: 24, t. 27 (1898); Sim, For. Fl. Cape Col. 213, t. 62 (1907); Sim, For. Fl. P.E.A. 59, t. 58 (1909); Marloth, Fl. S. Afr. II, 1: t. 30 (1925).

A. gummifera non (Gmel.) C.A.Sm., C.A.Sm. in Kew Bull. 218 (1930), *pro parte*; Burt Davy, l.c. 2: 349 (1932); Henkel, Woody Pl. Natal and Zul. 236 (1934); Codd, l.c. 55 (1951).

Tree 7–15 m tall with a flat, spreading crown; bark grey; young twigs rusty pubescent. *Leaves* 12–22 cm and 8–12 cm broad; petiole 3–4 cm long; petiole and rachis rusty pubescent; pinnae 4–7 pairs; leaflets 6–12 pairs, trapeziform, 1–1.6 cm long and 5–8 mm broad, sparingly hispidulous and dark green above, hispidulous and paler below; midrib diagonal. *Inflorescence* 15–25 flowered; peduncles 2.5–6 cm long, fulvous; bracts and bracteoles minute, early deciduous. *Flowers* whitish, shortly pedicellate, of two kinds; outer flowers hermaphrodite, with a few larger male flowers at the centre. *Calyx* 4.5–5.5 mm long, 5-toothed, fulvo-tomentose. *Corolla* 8–10 mm long, 5-lobed, grey pubescent; tube subcylindrical, widening towards the mouth, 6–7 mm long; lobes lanceolate—oblong, 2–3 mm long, apex cucullate. *Stamens* 2.5–3.2 cm long, united into a narrow tube for 1.8–2.6 cm. *Ovary* glabrous, 2.5 mm long, subsessile; style filiform, exceeding the stamens. *Pod* several seeded, linear to linear oblong, 11–16 cm long and 2.3–2.6 cm broad, flat, thin textured, pubescent, rugose, pale brown; margin thickened, straight or wavy; position of seeds apparent as bumps on the valves.

Distributed from Senegal to Abyssinia and, southwards, through east Tropical Africa to Rhodesia, Mocambique, Transvaal, Natal and to Port St. Johns in the Cape Province.

TRANSVAAL.—Soutpansberg: Tshakoma, *Obermeyer* 975; Shewass, *Legat* in TM 6259; Makonde, *Westphal* 5; *Curson and Irvine* 78; Pepeti Falls, *Curson and Irvine* 97; Kruger National Park, near Punda Maria, *Lamont* 43; *Codd* 6529; *van der Schijff* 3784.

NATAL.—Without locality, *Mrs. Saunders* s.n. (BOL); *Gerrard and McKen* 397 (NH). Zululand: Bazwana, *Gerstner* 3725 (NH). Ingwavuma: Mangazi Forest, Maputa, *Bayer* 753. Hlabisa: St. Lucia Bay, *Pole Evans* 3646; near Hluhluwe Game Reserve, *Ward* 2627. Mtunzini: Ngoye Forest, *Schmidt* in For. Dept. Herb. 1445. Eshowe: Forest adjoining Eshowe, *Codd* 1864. Mapumulo: Umhlali, *Repton* 1838. Inanda: near Umzinyati Falls, *McClean and Ogilvie* in NH 28868. Durban: *Medley Wood* 6135. Pinetown: Amanzimtoti, *Gerstner* in NH 22080 (NH). Umzinto: Dumisa, *Rudatis* 681; Umdoni Park, *Smuts* 2340. Port Shepstone: 2½ miles W. of Southbroom, *Marais* 1147.

CAPE PROVINCE.—Lusikisiki: 2½ miles N. of Embotyi, *Codd* 9740.

The difficult problem of species limits and synonymy in the *A. gummifera*—*A. adianthifolia*—*A. zygia* complex has been dealt with by Brenan in Kew Bull. 1952: 520, and his conclusions are followed here.

A. adianthifolia is a conspicuous tree of the coastal forests of Natal, with its spreading, flat crown of graceful foliage. Sim, in his Forest Flora of the Cape of Good Hope, states that the wood is fine grained, rather soft and susceptible to borer.

EXOTIC SPECIES.

12. *A. lebbeck* (L.) Benth. in Journ. Bot. Lond. 3: 87 (1844) (as "*A. lebbeck*"); Brenan and Greenw., l.c. 342 (1949).

Type: Linnaean Herbarium, No. 1228/16.

Mimosa lebbeck L., Sp. Pl. ed. 1: 516 (1753).

M. lebbeck Forsk., Fl. Aegypt. Arab. 177 (1775).

Acacia lebbeck (L.) Willd., Sp. Pl. 4: 1066 (1806); DC., Prodr. 2: 466 (1825).

Tree 8–15 m tall with a large round crown; bark grey, fissured; branchlets glabrous to tomentose. Leaves 15–35 cm long and 12–30 cm broad; petiole 5–8 cm long; petiole and rachis pubescent to glabrescent; pinnae 2–4 pairs; leaflets 5–9 pairs, sparingly hispidulous to glabrous, paler below, oblong to broadly elliptical, 2.5–4.4 cm long and 1–2.4 cm broad, oblique at the base, apex rounded, often emarginate; margin not crisped. Inflorescences 1–3 in axils of terminal leaves, each of 20–25 flowers; peduncle 4–6 cm long; peduncle and buds brownish tomentose. Flowers white; pedicels 2–2.5 mm long. Calyx subcampanulate, 4–4.5 mm long, 5-toothed, grey-brown tomentose. Corolla 6–8 mm long, 5-lobed, almost completely glabrous below with patches of whitish tomentum towards the apex; tube subcylindrical, 4–5.5 mm long; lobes ovate-lanceolate 2–3.5 mm long. Stamens 2–2.5 cm long, united at the base for 5–5.5 mm. Ovary glabrous, 2 mm long; style filiform, exceeding the stamens. Pod several seeded, linear to linear-oblong, 12–20 cm long and 3.5–4.5 cm broad, flat, thin textured, light to dark brown; margin thickened, usually straight; position of seeds visible as raised bumps in the valve.

A native of tropical Asia and, probably, tropical Africa, widely cultivated in the tropics. Cultivated and semi-naturalised along the north coast of Natal. According to Forskahl, the specific name is derived from the Arabian name Labach for the tree.

TRANSVAAL.—Pretoria: Meyer s.n.

NATAL.—Mtunzini: Lawn 2118; Gingindhlovu, Lawn 1863 (NH); valley near Gingindhlovu, Lawn (NH). Inanda: 2 miles S. of Verulam, Codd 9653.

A. lebbeck is growing in the Botanic Gardens, Durban, and the specimens collected from the coastal areas of Natal and Zululand are from trees that are very likely cultivated or semi-naturalised. The species is included in this treatment because it is sometimes confused in the herbarium with *A. tanganyicensis* and *A. suluensis*. For the distinguishing characters, see the discussions under those species.

It is a graceful tree of easy culture in a frost-free climate, forming a fairly straight trunk and a round crown of attractive, dark green foliage. Brenan and Greenway record that it produces a useful timber and that the leaves are browsed by stock.

13. *A. lophantha* (Willd.) Benth. in Hook. Lond. Journ. Bot. 3: 86 (1844); Fl. Austral. 2: 421 (1864).

Type: It is not known if a specimen is preserved on which Ventenat, Jard. Cels. t. 20, based his description and figure; if not, the latter will suffice as the type.

Acacia lophantha Willd. Sp. Pl. 4: 1070 (1806); DC., Prodr. 2: 457 (1825).

Mimosa distachya Vent. Jard. Cels. t. 20 (1800 or 1801), non Cav. Ic. 3: 48, t. 295 (1794 or 1795).

Type: As above.

Albizzia distachya (Vent.) MacBride in Contrib. Gray Herb. n.s. 59: 3 (1919); Salter in Adamson and Salter, Fl. Cape Penins. 452 (1950).

Tree 4–7 m tall; branchlets usually velvety pubescent. *Leaves* 20–25 cm long and 11–18 cm broad; petiole 3–7 cm long; petiole and rhachis pubescent; pinnae 7–12 pairs; leaflets 20–35 pairs, linear oblong, 7.5–11 mm long and 2–2.5 mm broad, sparingly pubescent to glabrous, oblique at the base, apex obtuse to rounded, mucronulate; midrib nearer to upper margin. *Inflorescence* spicate, 4–8 cm long, axillary, 1–3 per axil; peduncle 0.8–1.5 cm long, fulvo-tomentose. *Flowers* creamy to yellowish; pedicels 1–2.5 mm long. *Calyx* campanulate, 2–2.5 mm long, 5-toothed, pubescent. *Corolla* 5.5–6.5 mm long, 5-lobed, appressed pubescent; tube subcampanulate, 4–5 mm long; lobes ovate, cucullate, 1.5 mm long. *Stamens* 1.3–1.5 cm long, united at the base for 1.5–2.5 mm. *Ovary* glabrous, 2.5 mm long, very shortly stipitate; style filiform, exceeding the stamens by 6–7 mm. *Pod* several seeded, linear to linear oblong, 6–11 cm long and 1.4–1.6 cm broad, flat, semi-woody, light to dark brown; margin slightly thickened, straight or nearly so; position of seeds clearly evident as raised bumps on the valve; seeds, when mature, loose and rattling in the pod.

Native of the south-western coastal region of Western Australia and naturalised in South Africa, especially along the coast from Humansdorp to the Peninsula.

NATAL.—South Coast, *Wood* 10588 (NH).

CAPE PROVINCE.—Humansdorp: *Rogers* 3021; *Fourcade* 3934 (BOL). Knysna: *District Forest Officer* in PRE 8707. Riversdale: Corente River Farm, *Muir* in Hb. Galpin 5092. Caledon: Kogel Bay, *Parker* 4206 (BOL). Cape Peninsula: Simons-town, *Watt* and *Brandwijk* 1682; Rondebosch, *Gerstner* 6135; Edinburg Estate, *Salter* 7356 (BOL).

It is not known when this species was introduced into South Africa. The earliest herbarium specimen seen is from the Riversdale District, dated December, 1908, when it was already recorded as “common on river banks”. Collectors describe it as almost a ruderal weed, being common and gregarious along river banks, forest margins and in wooded ravines.

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Studies of Wood-Rotting Fungi:

1. Cultural Characteristics of some Common Species.

By

G. C. A. van der Westhuizen.

It is often essential to identify the organisms causing decay to timber. Since a sporophore is seldom present, diagnostic features other than those important ones usually provided by the sporophore must be sought. It has long been known that wood-rotting fungi grow readily on artificial media, but only comparatively recently have cultural characters been used as in aid in the identification of non-fruiting mycelium. A difficulty peculiar to the identification of these fungi in culture is that the morphological characters shown are applicable directly to the species only and cannot be used in the identification of other species in the same genus.

Among the first workers in this field were Long and Harsch (12) and Fritz (11), who established criteria for distinguishing wood-rotting fungi in pure culture. This work was followed by studies of fungi causing decay of a specific host, or the species of a single genus in artificial culture. Bavendamm (1) and Davidson, Campbell and Blaisdell (9) showed that the behaviour of decay fungi on media containing gallic acid and tannic acid is a valuable aid in the identification of the fungus. But the different workers followed different methods so that it was still difficult or impossible to identify a fungus from culture unless many different methods were followed. Recently, Nobles (16) made an exhaustive study of the various methods and incorporated many of these into a standard procedure. This procedure has been followed, with some modification, by da Costa, Matters and Tamblyn (8). The macroscopic features of the colony are described in terms defined by Long and Harsch (12). Colours are recorded according to Ridgway's Colour Standards or the Munsell Book of Colour. The behaviour of the fungus on 0.5 per cent gallic acid and tannic acid in malt agar, and the growth rate and appearance on 1.5 per cent malt agar are noted. These features, as well as the nature of the host plant, the presence of fructifications and the microscopic characters, are expressed by a system of numerals termed the key pattern. Each digit refers to a specific character. Digits are arranged in eleven columns in ascending numerical order. For workers to whom Nobles' (16) paper is not readily available, the list indicating the meaning of each digit is appended below.

In the present paper, the cultural characters of a number of fungi are described. Some of them have been described before by other workers, but are included here to emphasize the similarities or differences between specimens from South Africa and elsewhere. Others are South African species and their cultural characteristics are described here for the first time.

METHODS AND MATERIALS.

The methods followed were those described by Nobles (16) and da Costa *et al.* (8) but with small modifications. The fungi were grown on 1.5 per cent Difco malt extract agar in three inch Petri dishes, each plate containing 30 ml. of medium. Inocula were cut out with a sterile cork borer of 10 mm diameter from the youngest part of an

actively growing colony and placed mycelium downwards near one side of the plate. Six plates of each fungus were incubated at 26° C., one plate being removed and placed in diffuse daylight at room temperature at weekly intervals. All cultures were examined at weekly intervals for changes of colour and other characteristics. All colours are described according to Ridgway's terminology (19).

The oxidase tests were carried out on media containing 1·5 per cent Difco malt extract agar and 0·5 per cent gallic acid and tannic acid, respectively, as described by Davidson, Campbell and Blaisdell (9). Incubation was at 26° C. for seven days or fourteen days for the slower growing species.

LIST INDICATING THE MEANING ATTACHED TO EACH DIGIT AS USED IN THE KEY PATTERN.

[NOBLES; (16) P. 291.]

First column: Host.

1. Occuring on broad-leaved trees.
2. Occuring on coniferous trees.

Second column: Colour of mycelial mat.

1. Mat remaining white, pale yellow or pale pink for six weeks.
2. Mat yellow or brown, at least when mature.

Third column: Reaction on media containing gallic acid and tannic acid.

1. Diffusion zone present.
2. Diffusion zone lacking.

Fourth column: Septation of phyphae.

1. Clamp connections present on all parts of mat but may be lacking on fibre hyphae.
2. Simple septa on all hyphae.
3. Hyphae of advancing zone with simple septa, those of older part of mat with clamp connections.
4. Multiple clamp connections present, at least in the advancing zone.

Fifth column: Special structures.

0. Contorted incrustated hyphae.
1. Cystidia or gloeocystidia.
2. Setae or setal hyphae.
3. Bulbils.
4. Rigid hyphae with right-angled branches.
5. Cuticular cells, forming a pseudo-paranchymatous layer.
6. Hyphae with numerous interlocking projections.
7. Swellings on hyphae.
8. Lactiferous cells.
9. No special structures.

Sixth column: Chlamydospores.

1. Chlamydospores present.
2. Chlamydospores absent.

KEY TO THE FUNGI DESCRIBED IN THIS PAPER.

Host.	Mat Colour.	Oxidase.	Septation.	Special Structures.	Chlamydospores.	Conidia.	Oidia.	Growth Rate.	Fruiting.	Reverse.	
1	1	1	1	1	2	2	2	1	1	2	<i>S. purpureum.</i>
1	1	1	1	1	2	2	2	1	1	3	<i>S. purpureum.</i>
1	1	1	1	9	1	2	2	1	1	3	<i>T. cingulata.</i>
1	1	1	1	9	1	2	2	1	2	3	<i>T. cingulata.</i>
1	1	1	1	9	1	2	2	2	2	3	<i>P. hirsutus.</i>
1	1	1	1	9	1	2	2	2	1	2	<i>S. commune.</i>
1	1	1	1	9	1	2	2	2	1	3	<i>S. commune.</i>
1	1	1	1	9	1	2	2	2	2	2	<i>S. commune.</i>
1	1	1	1	9	2	2	1	2	2	3	<i>S. commune.</i>
1	1	1	1	9	2	2	2	1	1	3	<i>L. palisoti.</i>
1	1	1	1	9	2	2	2	1	2	3	<i>P. hirsutus.</i>
1	1	1	1	9	2	2	2	1	2	2	<i>P. hirsutus.</i>
1	1	1	4	9	2	2	2	1	2	2	<i>S. hirsutum.</i>
1	1	1	4	9	2	2	2	1	2	3	<i>S. hirsutum.</i>
1	1	2	1	9	1	2	2	2	1	2	<i>S. commune.</i>
1	1	2	1	9	1	2	2	2	1	3	<i>S. commune.</i>
1	1	2	1	9	1	2	2	2	2	2	<i>S. commune.</i>
1	1	2	1	9	1	2	2	2	2	3	<i>S. commune.</i>
1	1	2	1	9	2	2	2	1	1	2	<i>P. vaillantii.</i>
1	1	2	1	9	2	2	2	1	2	2	<i>P. vaillantii.</i>
1	1	2	1	9	2	2	2	2	1	2	<i>P. vaillantii.</i>
1	1	2	1	9	2	2	2	2	2	2	<i>P. vaillantii.</i>
1	1	2	4	9	2	2	2	1	2	2	<i>C. arida.</i>
1	2	1	1	0	2	2	2	1	1	3	<i>T. proteus.</i>
1	2	1	1	0	2	2	2	1	2	3	<i>T. proteus.</i>
1	2	1	1	6	2	2	2	1	1	3	<i>P. arcularius.</i>
1	2	1	1	6	2	2	2	1	2	3	<i>P. arcularius.</i>
1	2	1	1	7	2	2	2	1	2	3	<i>A. rude.</i>
1	2	1	1	9	1	2	2	1	1	2	<i>P. sanguineus.</i>
1	2	1	1	9	1	2	2	1	1	3	<i>P. sanguineus.</i>
1	2	1	1	9	1	2	2	1	2	1	<i>L. sajor-caju.</i>
1	2	1	1	9	1	2	2	1	2	2	<i>P. sanguineus.</i>
1	2	1	1	9	2	2	2	1	2	3	<i>P. sanguineus.</i>
2	1	1	1	9	1	2	2	1	1	3	<i>G. colossum.</i>
2	1	1	1	9	1	2	2	1	2	3	<i>P. hirsutus.</i>
2	1	1	1	9	2	2	1	2	2	3	<i>P. hirsutus.</i>
2	1	1	1	9	2	2	2	1	1	3	<i>L. palisoti.</i>
2	1	1	1	9	2	2	2	1	2	3	<i>P. hirsutus.</i>
2	1	1	4	9	2	2	2	1	2	2	<i>P. hirsutus.</i>
2	1	1	4	9	2	2	2	1	2	2	<i>S. hirsutum.</i>
2	1	1	4	9	2	2	2	2	2	3	<i>S. hirsutum.</i>
2	1	2	4	9	2	2	2	2	2	2	<i>S. sanguinolentum.</i>
2	2	1	1	9	1	2	2	1	1	2	<i>C. arida.</i>
2	2	1	1	9	1	2	2	1	1	2	<i>P. sanguineus.</i>
2	2	1	1	9	1	2	2	1	1	3	<i>P. sanguineus.</i>
2	2	1	1	9	1	2	2	1	2	2	<i>P. sanguineus.</i>
2	2	1	1	9	1	2	2	1	2	3	<i>P. sanguineus.</i>
2	2	2	1	9	1	2	2	1	2	2	<i>G. colossum.</i>

Seventh column: Conidia.

1. Conidia present.
2. Conidia absent.

Eighth column: Oidia.

1. Oidia present.
2. Oidia absent.

Ninth column: Rate of Growth.

1. Rapid growth, plates covered in one to two weeks.
2. Moderately rapid, plates covered in three to four weeks.
3. Slow, plates covered in five to six weeks.
4. Very slow, plates not covered in six weeks.

Tenth column: Fruiting.

1. Fruiting before the end of six weeks.
2. No fruiting.

Eleventh column: Effect on Agar.

1. Reverse brown, at least in part, before the end of six weeks.
2. Reverse unchanged, or not darker than honey yellow in six weeks.
3. Reverse bleached, at least in part, before the end of six weeks.

1. *Amauroderma rude* (Berk.) G. H. Gunn. (Pl. 1; Fig. 1, Pl. 4, Fig. 1.)

Key pattern: 1 2 1 1 7 2 2 2 1 2 3.

Growth characters: Growth is rapid, the colony reaching a radius of 40 mm in seven days and covering the plate in two weeks. The advancing zone is even, transparent, appressed for about 0.5 mm, then slightly raised. The mat is at first white, cottony, but after two weeks, thin strands of mycelium appear and the mycelium darkens to "pale brownish drab" in some places. The colour darkens gradually as the mat becomes more felty or sub-felty in places and dark "hairs" start growing out onto the side of the dish. After six weeks, the mat is mostly "buffy brown" and sub-felty to crustose in places with patches of "avellaneous", "olive brown", "wood brown" and "natal brown". The mat is tough but separates readily from the agar and a faint, fragrant odour is given off. Reverse, bleached to "ochraceous buff" but later mottled with lines of "buckthorn brown" and "warm blackish brown" in the agar.

On gallic and tannic acid media there is good growth, the colonies reaching diameters up to 45 mm with strong diffusion zones up to 50 mm diameter after seven days.

Hyphal characters.

Advancing zone.—Hyphae hyaline, thin-walled, branched, septate with simple clamps of the "eyelet" type, 3–6 μ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae numerous, hyaline, without lumen and walls thick and refractive, 2–3 μ wide. (c) Hyphae with thick, refractive walls and narrow lumina which widen towards the tip and with deeply staining contents, 4–6 μ wide. (d) Wide hyphae, 4–6 μ wide, with slightly thickened, hyaline walls, clamp connections at the septa and wide lumina with deeply staining contents, with narrow thick-walled fibre hyphae, 2–3 μ , branching from them. (e) Narrow fibre-like hyphae, 2–3 μ , with thickened walls, at first hyaline, later brown, with inflated terminal or intercalary parts up to 20 μ wide, forming a tough, crustose skin on the mat.

Submerged mycelium.—Hyphae as in the advancing zone.

A. rude is very common in wattle plantations in South Africa and has been reported as the cause of decay of stumps and roots of *Acacia mollissima*. It has also been found on unspecified dead wood (10). With its unique key pattern and combination of readily recognizable microscopic features, the identification of this fungus from culture should be relatively easy.

2. *Coniophora arida* (Fries) Karst. (Pl. 1, Fig. 2; Pl. 4, Fig. 2.).

Key pattern: (1, 2) 1 2 4 9 2 2 2 1 1 2.

Growth characters.—Growth is fast, the colony reaching a radius of 38 mm after seven days and covering the plate in two weeks. The advancing zone is bayed and hyphae are raised right to the limit of growth. The mycelium is at first raised, silky, but becomes appressed after two weeks and thin rhizomorphs begin to appear and radiate from the inoculum over the surface of the agar. After 3–4 weeks the surface appears uneven or lacunose with hyphae thin and silky and the agar surface almost liquified. No further changes take place. The colour of the mat is at first hyaline, later turning pale greyish. The mat remains soft and adherent to the agar which is slightly bleached or remains unchanged. A faint odour is emitted.

On gallic and tannic acid media, no diffusion zones are found, while the colony reaches diameters of 60 mm on the former and 15 mm on the latter medium after seven days incubation.

Hyphal characters.

Advancing zone.—Hyphae smooth, branching, nodose-septate with multiple clamps arranged in a whorl, often with a whorl of branches from the clamps. Hyphae are usually 3–6 μ wide.

Aerial mycelium.—(a) Hyphae as in advancing zone, 2.5–10 μ . (b) Hyphae with simple clamps, 3–6 μ . (c) Wide hyphae with simple septa are present together with the ordinary hyphae in the rhizomorphs on the surface.

Submerged hyphae.—(a) Hyphae as in the advancing zone. (b) Knobbly, tortuous, branching hyphae with simple septa 2–6 μ wide.

Comparison with Nobles' key shows that *C. puteana*, to which *C. arida* is closely related, has an identical key pattern. There is indeed a very close resemblance between the cultures of these two species and only a few small characters separate them. In *C. arida* cultures, the advancing zone is bayed and the mat remains uncoloured while the mat of *C. puteana* may be coloured and the margin even. These differences are, however, so small as to suggest that the two fungi are probably different forms of the same species.

C. arida has been found to cause a brown rot of coniferous trees but also occurs saprophytically on deciduous trees such as *Acacia mollissima*.

3. *Ganoderma colossum* (Fr.) Bres. (Pl. 1, Fig. 3; Pl. 4, Fig. 3.).

Key pattern: (1, 2) 2 2 1 9 2 2 2 2 2 2.

Growth Characters.—Growth is moderately fast, the colony reaching a radius of 65 mm after 14 days. The advancing zone is even, slightly raised and is preceded by a zone of turbid agar about 8 mm wide. At first, the mat is silky but after two weeks, patches or tufts of cottony mycelium start to form on the sides of the dish. These

later become compacted into woolly or felty pads up to 5 mm wide around the edge of the mat. The young mat is white and remains so for longer than six weeks, but the dense mycelium on the sides of the dish turns to "cream color" or "buff yellow" after three to four weeks and darkens to "antimony yellow" and "cinnamon buff". The mat remains soft and adherent to the agar, while the reverse remains unchanged.

On gallic and tannic acid media there is good growth, the colonies reaching diameters of about 35 mm after seven days but no diffusion zones are formed. On tannic acid medium, a clear zone is formed slightly larger in diameter than the colony.

Hyphal characters.

Advancing zone.—Hyphae thin-walled, branched, nodose-septate with simple clamps of the "eyelet" type, often with branches arising opposite clamps, 3–6 μ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Thin-walled hyphae without clamps and few simple septa, 1.5–2 μ wide. (c) Hyphae as in advancing zone but with walls light brown. (d) Hyphae with deeply staining contents and simple septa, irregularly widened and distended, 5–8 μ diameter.

Submerged mycelium.—(a) Hyphae as in the advancing zone. (b) Much branched hyphae with simple septa.

G. colossum has been isolated from *Pinus hondurensis* and *Callitris robusta* in Natal on which it causes an extensive collar rot. It also attacks eucalypts (14).

There are no marked morphological features by which *G. colossum* can be identified in culture. The restricted host range, the absence of a diffusion zone on the oxidase media together with the colour of the mycelial mat, which so closely resembles the colour of the large fructifications, and the microscopic appearance of the hyphae, should allow the easy identification of a culture of this fungus.

4. *Lentinus sajor-caju* Fr. (Pl. 1, Fig. 4; Pl. 4, Fig. 4.).

Key pattern: 1 2 1 1 9 1 2 2 1 2 1.

Growth characters.—Growth is rapid, the colony reaching a radius of 55 mm in seven days and the plate being covered in ten days. The advancing zone is even to slightly bayed, appressed, silky for 2–3 mm behind the tips and then raised. The mat is at first cottony to woolly, turning felty to sub-felty with nodulose or granular bands over the surface. As the culture ages, some areas become sub-felty to crustose. At first, the mat is white, but, after three weeks, patches of "light quaker drab" appear, but some darken to "quaker drab" or "mouse grey" so that the culture assumes a grey, marbled appearance. The agar is bleached but then darkens to "warm buff" with dark brown wavy lines giving a mottled appearance.

After two weeks growth, the edge of the mat turns upward and inward and small hyaline papillae appear, growing out from the mat and appressing their ends against the glass side of the dish. A sweet, fragrant odour is emitted by the fungus.

On gallic and tannic acid media, there are strong diffusion zones of 25–40 mm on the two media respectively, after seven days, while the colonies reach diameters of 15 mm and 35 mm.

Hyphal characters.

Advancing zone.—Hyphae thin-walled, branching, nodose-septate with simple clamps of "eyelet" type, 3–5 μ wide.

Aerial mycelium.—(a) Hyphae as in advancing zone. (b) Fibre hyphae numerous, thick-walled, branched or unbranched, $1.5\text{--}2.5\ \mu$. (c) Chlamydospores hyaline, elliptical, oval or short, cylindrical with rounded ends, $6\text{--}8 \times 9\text{--}12\ \mu$. (d) Hyphae with thin walls and bladderlike swellings and projections which later turn brown to form a crustose layer.

Submerged mycelium.—Hyphae as in the advancing zone but with occasional chlamydospores.

The most striking feature of this culture is the appearance of the papillae which seem to push the edge of the colony away from the sides of the Petri dish. This feature, together with the strong fragrant odour given off by the mycelium and the unique key pattern, should establish the identity of the culture with certainty.

L. sajor-caju causes a white rot of felled deciduous trees.

5. *Lenzites palisoti* Fr. (Pl. 1, Fig. 5; Pl. 4, Fig. 5.).

Key pattern: (1, 2) 1 1 1 9 2 2 1 2 2 3.

Growth characters.—Growth is moderately fast, the plate being covered in three weeks. The advancing zone is even, thin and closely appressed to the medium. The mat is at first thin, with a chamois texture and later slightly farinaceous with numerous tiny, clear droplets of liquid on it. Later it thickens, becoming compacted felty and slightly furrowed in the thicker parts. Thin, tough, smooth pads may develop over the surface. After six weeks the entire colony is farinaceous. The mat remains white throughout or a "cream color" on some of the thickened pads. The agar is bleached and the reverse is yellowish.

The mat is tough, adherent to the agar and emits a strong, sweetly fragrant, slightly musty odour.

On the oxidase test media, there are strong diffusion zones with growth up to 32 mm diameter on gallic acid and 10 mm diameter on tannic acid in seven days.

Hyphal characters.

Advancing zone.—Hyphae thin-walled, simple or branched nodose-septate with simple clamps often branching from the clamps, $1.5\text{--}4\ \mu$ diameter.

Aerial mycelium.—(a) Hyphae as in advancing zone. (b) Fibre hyphae numerous, thick-walled, with narrow lumina which widen characteristically at the tips, $3\text{--}4\ \mu$ diameter. Walls sometimes dilated into a vesicle as well. (c) Oidia elongate, cylindrical, with rounded ends or barrel-shaped to nearly globose, $4\text{--}9 \times 2\text{--}4\ \mu$.

Submerged mycelium.—Hyphae as in advancing zone but more tortuous and with more clamps, $2\text{--}4\ \mu$ diameter.

The strong, fragrant odour emitted by this fungus and the pure white mat with its dewy appearance, should give an indication of its identity which may be confirmed by the presence of the characteristic fibre hyphae and the unique key pattern. The digit denoting swellings on hyphae is not included in the key pattern because these swellings are only seen very occasionally.

The key pattern denotes the presence of clamps on the hyphae but this fungus has a tendency to revert to the haploid condition after repeated subculture. This is accompanied by loss of vigour as demonstrated by a retardation in the growth rate, an increased production of oidia and growth with a very strongly indented margin. As the characters otherwise remain unchanged and new isolates are invariably diploid, the key pattern is presented as applicable to new isolates.

L. palisoti is a very common cause of white rot on timber in use but occurs on a number of living trees as well (10).

6. *Polyporus arcularius* Batsch ex Fries (Pl. 1, Fig. 6; Pl. 4.).

Key pattern: 1 2 1 1 6 2 2 2 (1, 2) 3.

Growth characters.—Growth is rapid, the colony reaching a radius of 43 mm in seven days and covering the plate after 14 days. The advancing zone is even, thin, appressed for 2–3 mm, then raised. The aerial mycelium is at first white, cottony to woolly, soon becoming more compact and granulose to lacunose felty, with crustose or skinlike and brittle areas. The white mat soon shows irregular patches of “russet” to “cinnamon brown” with a thin brown zone line appearing where the mat meets the agar at the sides of the dish. With progressing age, the culture assumes a mottled appearance with white areas mingled with “russet”, “mars brown”, “Prouts brown” and “mummy brown” patches and lines. The crustose, dark-coloured patches often have raised edges where they meet the white areas. The mat is tough after six weeks and a faint, yeasty odour is noticeable. Stalks of pilei appear after 2–3 weeks on some cultures and elongate into numerous contortions but bear normal pilei at their ends. The reverse of the colony may be bleached or turn “honey yellow”. Lines of “antique brown” to “Prout’s brown” appear in most cultures in the bleached agar.

On gallic and tannic acid media, strong diffusion zones of 55 mm diameter appear under colonies which reach diameters of 30 mm and 50 mm on the two media, respectively.

Hyphal characters.

Advancing zone.—Hyphae thin, branching, nodose-septate with simple clamps, 2–4 μ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae numerous, walls thick, refractive, branched, 1.5–2.5 μ . (c) Hyphae from dark skin-like areas, nodose-septate, thick-walled, often without lumina, buffy brown in KOH with numerous short side branches or knoblike projections, interlocked to form a tough, coherent mat which defies separation into single elements. Fruit body: Basidia hyaline, 14–16 \times 4–5 μ with four sterigmata. Basidiospores: smooth, oblong-elliptical, hyaline, 6 \times 2.5 μ .

Submerged mycelium.—Hyphae as in the advancing zone.

The above description corresponds closely with Nobles’ description (16) except for colour, which in my cultures was always browner. No chlamydospores were observed in these cultures. The formation of normal fructifications with their characteristic large pores took place very readily on some of the cultures.

P. arcularius is found fairly frequently on decayed wood of broad-leaved trees in contact with the soil but does not seem to be important as a wood destroyer in South Africa.

7. *Polyporus sanguineus* Linn. ex Fries (Pl. 2, Fig. 1; Pl. 4, Fig. 7.).

Key pattern: (1, 2) 2 1 1 9 1 2 2 1 (1, 2) (2, 3).

Growth characters.—Growth is fast, the colony reaching a radius of 50 mm in seven days and covering the plate in twelve days. The advancing zone is even, appressed for 1–2 mm then raised, hyaline. The texture is at first cottony to woolly, lacunose in the denser parts and later granular, turning to velvety or chamois near the inoculum. From the inoculum, broad, shallow furrows radiate out to some distance behind the advancing edge. At about four weeks incubation, the dense parts of the colony become compacted into tough, felty to velvety pads, often raised above the level of the surrounding mat. On some of these, pores are developed which shed white spore deposits if the plate is inverted.

The mat is at first white but after one to three weeks, tinges of "pale salmon color" appear which later deepen to "salmon color", "apricot orange", "carnelian red" or "flame scarlet" in the older parts with occasional "cinnamon rufous" near the edge of the newest growth. The reverse is unchanged in some cultures and bleached in others. A faint, pleasant odour is present.

On gallic and tannic acid media, there are strong diffusion zones of up to 65 mm diameter, while colony diameters vary from 35–55 mm on gallic acid and 0–55 mm on tannic acid media.

Hyphal characters.

Advancing zone.—Hyphae thin-walled, smooth, branched, nodose-septate with simple clamps of the "eyelet" type, $2\text{--}5\ \mu$ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae with thick, refractive walls and no lumina, branching, very numerous, $2\text{--}4\ \mu$ wide. (c) Chlamydospores smooth, hyaline, terminal or intercalary, rare in some cultures, more numerous in others, with walls slightly thickened, $4\text{--}9 \times 6\text{--}14\ \mu$.

Fruit body.—(a) Basidia clavate, $4\text{--}5\text{--}6\ \mu$ wide with four spores. (b) Basidiospores hyaline, short, cylindrical, $4\text{--}5\text{--}6 \times 2\text{--}5\text{--}3\ \mu$.

Submerged mycelium.—(a) Nodose-septate hyphae, (b) fibre hyphae and (c) chlamydospores as above.

The cultures described here are very similar to those described by Nobles (16) and Matters *et al.* (15). Like those described by the latter authors, the South African fungi tend to bleach the medium but differ from them by having higher growth rates.

Bose (2) noticed that cultures of *P. cinnabarinus* differed from those of *P. sanguineus*, two species considered to be identical by Wakefield (2) and Lloyd (13), in that the hyphae of the latter develop a pigment on their walls so that the whole mat looks orange, while the hyphae of the former remain white and the characteristic orange-red colours only appear when basidia initials are formed in the cultures. Colour is consequently confined to poroid areas of cultures of *P. cinnabarinus*. It has been noticed that amongst the cultures described here, there are some which tend to form colour at a later stage of development and in localized patches only. In the others, colour is formed at an early stage and is more or less of an even hue over the whole surface of the culture. The sporophores from which these cultures were made were, however, identified as those of *P. sanguineus*. This phenomenon is considered to be caused by differences between different strains of the same organism.

P. sanguineus can be readily recognized in culture by the bright orange-red colours formed, without recourse to microscopic examination.

This fungus is widely distributed throughout South Africa and has been found on living trees (Doidge 10) and on dead wood in which it causes a white rot.

8. *Polystictus hirsutus* Wulf. ex Fries (Pl. 2, Fig. 2; Pl. 4, Fig. 8.).

Key pattern: (1, 2) 1 1 1 9 (1, 2) 2 2 1 (1, 2) 3.

Growth characters.—Growth is rapid, a radius of 55–60 mm being reached in one week, while the plates are covered in 9–10 days. The advancing zone is even, appressed or slightly raised. The mat is at first cottony but soon becomes woolly and compacted to felty or sub-felty in some places round the inoculum, but finally tough, dense, felty and slightly lacunose, with mounds of compact waxy mycelium over the surface.

Mycelium frequently grows out between the dish and cover to form poroid fructifications. The predominating colour is white but patches of "cream color" occur near the sides of the dish and on the poroid mounds. The reverse is rapidly bleached and cleared.

Growth on gallic acid medium does not occur or produces a mere trace of mycelium with a strong diffusion zone. On tannic acid, the colony may reach 40 mm diameter in seven days, while a strong diffusion zone, slightly wider, is formed. Odour is lacking or may be faint, sweetish.

Hyphal characters.

Advancing zone.—Hyphae hyaline, branched, nodose-septate with simple clamps, 3–5 μ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae very numerous, with walls thick and refractive, lumina narrow or lacking, aseptate, branched, 1.5–3 μ .

Fructication.—Basidia 4.5–6 μ diameter, having four spores. Basidiospores hyaline, even, cylindrical, 5–7 \times 2–5 μ .

Submerged mycelium.—(a) Hyphae as in advancing zone. (b) Chlamydospores observed in one isolate, terminal and intercalary, thin-walled, smooth, hyaline, 10–15 \times 4.5–7 μ .

The key pattern for *P. hirsutus* is identical with those of other fungi from which it can, however, be distinguished on the macroscopic appearance in culture. Nobles records, however, that the cultures of *Polyporus pubescens* and *P. zonatus* are closely similar to those of *P. hirsutus*. Although neither of these two species has been grown in culture by me yet, the former may not be a serious consideration in this respect as it is not at all common in this country. *P. zonatus* is more common and great care should be exercised in identification of cultures when there is the risk of confusing these two closely related species.

P. hirsutus causes a white rot of coniferous and hardwoods and has been reported on broad-leaved trees.

9. *Poria vaillantii* (D.C.) Fr. (Pl. 2, Fig. 3; Pl. 5, Fig. 1.).

Key pattern: 1 1 2 1 9 2 2 2 (1, 2) (1, 2) 2.

Growth characters.—Growth is moderately fast to fast, the plate being covered in twelve to twenty days. The advancing zone is even, appressed for 0.5 or 1 mm behind the extreme tips, then raised in a dense cottony or woolly mound but sinking again towards the inoculum. After three weeks, dense strands of hyphae form and radiate from the inoculum to the newer growth where their ends fan out into cottony plumes, which cling to the sides of the dish. With advancing age, the mycelium, clinging to the glass sides, is torn and becomes rather ragged through shrinkage of the agar. After two to four weeks, wide, shallow pores are formed on the dense mycelium of some cultures. Creamy spore deposits are formed if the plates are inverted.

The colour remains pure white throughout, except in the older parts of the fructification, which turn a pale cream colour. The aerial mycelium is easily stripped from a thin layer of mycelium which adheres to the agar. The reverse remains unchanged.

The fungus is negative for oxidase and no diffusion zones are formed. Growth on gallic acid may reach a diameter of 60 mm in one week, but no growth takes place on tannic acid.

Hyphal characters.

Advancing zone.—Hyphae thin-walled, branched, nodose-septate with simple clamps, often branching opposite a clamp, $2.5\text{--}6\ \mu$ diameter.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae without lumina, refractive, unbranched, $2.5\text{--}3.5\ \mu$. (c) Wide hyphae, irregularly swollen, $6\text{--}10\ \mu$ in diameter.

Fruit body.—(a) Hyphae as above. (b) Basidia: clavate with four sterigmata $6\text{--}8 \times 16\text{--}20\ \mu$. (c) Basidiospores hyaline, oblong-ellipsoid, slightly flattened on one side, $4.5\text{--}6 \times 3.5\ \mu$.

Submerged mycelium.—(a) Hyphae as in the advancing zone. (b) Crystals numerous.

The cultures described here agree very closely with the descriptions of Nobles (16) and Matters *et al.* (15). No chlamydospores were seen, though they were noted by Cartwright and Findlay (3) but fibre hyphae were numerous in both the fructification and the hyphal strands. This fungus may readily be recognised by the thin mat around the inoculum with its radiating strands of mycelium, which spread out into fan-shaped areas near the younger parts of the colony. In test tubes, these fan-shaped structures form a plug of hyphae near the edge of the slope, while the hyphal strands lead up to it over a thin mycelial mat.

10. *Schizophyllum commune* Fries. (Pl. 2, Fig. 4; Pl. 5, Fig. 2.).

Key pattern: 1 1 (1, 2) 1 9 1 2 2 2 (1, 2) (2, 3).

Growth characters.—Growth is moderately fast, the colony reaching a radius of 22–48 mm in seven days, while the plate is overgrown after 3–4 weeks. The advancing zone is bayed or almost even, thin, appressed or raised. The mat is at first cottony but soon denser patches of felty mycelium are formed. As growth proceeds, more or less fan-shaped areas of dense, felty mycelium may develop with shallow furrows radiating from the inoculum. From these compact, felty patches of mycelium, the normal fructifications usually develop. At this stage, the mat is usually tough and free from the agar. The colour remains white throughout, but fructifications may be “pale buff”. There is a slight musty odour. The reverse remains unchanged or may bleach slowly.

On the oxidase reaction media, the colonies reach diameters of 35–65 mm on gallic acid and 35–50 mm on tannic acid, while a strong diffusion zone is produced on tannic acid medium only.

Hyphal characters.

Advancing zone.—Hyphae are thin branching, smooth, nodose-septate with simple clamps, $2.5\text{--}5\ \mu$ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone but more frequently septate. (b) Fibre hyphae unbranched, with thick, refractive walls and narrow lumina, $1.5\text{--}3\ \mu$. (c) Thin-walled hyphae with short, narrow branches. (d) Chlamydospores: intercalary and terminal, hyaline, thick walled, sub-globose, oval or pyriform or elliptical, often divided by a single septum, $4\text{--}20 \times 4\text{--}8\ \mu$.

Fruit body.—Basidia: obovate or obclavate, often swollen at the top, with four sterigmata, $15\text{--}20 \times 3\text{--}4\ \mu$. Basidiospores: hyaline, cylindrical, rounded at the ends, obliquely apiculate, $2\text{--}3 \times 5\text{--}7\ \mu$.

Submerged mycelium.—(a) Hyphae as in the advancing zone. (b) Chlamydospores as above.

Schizophyllum commune is a very common saprophyte of timber (10) but has also been reported as a parasite of living trees (18). In culture, it is readily recognizable by the production of mature sporophores within a few weeks. Some cultures do not produce fructifications, but the presence of the thin-walled hyphae with the minute side branches, and the chlamydospores, which are usually present in large numbers, provide useful features for identification. The absence of a diffusion zone on gallic acid medium, in combination with these morphological characteristics, makes *S. commune* one of the easiest basidiomycetes to recognise in pure culture.

11. *Stereum hirsutum* (Willd.) Pers. (Pl. 2, Fig. 5; Pl. 5, Fig. 3.).

Key pattern: (1, 2) 1 1 4 9 2 2 2 1 2 (2, 3).

Growth characters.—Growth is rapid, the plate being covered in less than two weeks. The advancing zone is thin, even, appressed, but merges into the loose, cottony mycelium a few millimeters behind it. At two weeks, the culture has a thin, even cottony texture with little balls of dense compacted mycelium scattered through it. Gradually, the mycelium becomes denser and becomes compacted in some areas into smooth, felty or chamois areas.

The colour is at first hyaline, gradually turning creamy white to “cream color” with patches of “pinkish buff”, “light buff” to “ochraceous tawny” on thickened parts at the rim of the dish. On some of the cultures are thickened pads exuding drops of dark amber liquid.

The reverse of the colony turns to “ochraceous buff” after the agar is bleached. The mycelial mat is at first soft, but later toughens somewhat in the felty areas. A musty odour is given off by the growing colony.

Hyphal characters.

Advancing zone.—(a) Hyphae narrow, unbranched, with simple clamps over the septa, 1–2 μ wide. (b) Thin-walled hyphae 6–10 μ wide, with numerous, very conspicuous clamps arranged in whorls at the septa, branched, sometimes with branches from the clamps, often with narrow or wide side branches similarly nodose-septate or with simple septa or simple clamps at the septa.

Aerial mycelium.—(a) Hyphae as in the advancing zone but slightly wider, up to 12 μ . (b) Fibre hyphae with thick, refractive walls, sometimes faintly yellow, 1.5–3 μ . (c) Narrow, heliocoid hyphae, thin-walled, 2–3 μ wide.

Submerged mycelium.—Hyphae as in the advancing zone but more narrow hyphae, 1–2 μ wide and much branched, are present.

Stereum hirsutum has been described in pure culture by Cartwright and Findlay (3), but these authors do not mention the coiled hyphae which occur quite frequently in cultures, whose features otherwise agree closely with their descriptions and which were made from sporophores of undoubted *S. hirsutum*. This common fungus is probably one of the easiest to recognise in culture as the scattered compact balls of mycelium and the coarse hyphae with whorled clamp connections are characteristic.

12. *Stereum purpureum* (Pers. ex Fr.) Fries (Pl. 2, Fig. 6; Pl. 5, Fig. 4.).

Key pattern: 1 1 1 1 1 2 2 2 1 1 (2, 3).

Growth characters.—Growth is rapid, the mat attaining 70 mm in seven days and the plate being covered in about ten days. The advancing zone is even or slightly bayed and appressed in a zone about 1 mm wide, but the hyphae are then raised. The

texture is coarse, silky at first, becoming plumose to farinaceous in patches. The mycelium finally turns felty with nodules of compact mycelium against the glass sides of the dish. The colour remains white but a "pale buff", thin rind of fructification may appear on the side of the dish. The reverse remains unchanged or may be slightly bleached before six weeks. The mat is at first soft and adherent but later becomes tougher. There is a slight, musty odour.

On gallic and tannic acid agar, there is good growth, the colony attaining 63 mm diameter on gallic acid and 42 mm on tannic acid. The diffusion zones are fairly strong but much smaller than the colony, being about 45 and 35 mm for the two media, respectively.

Hyphal characters.

Advancing zone.—Hyphae are smooth, thin-walled, simple or branching, nodose-septate with simple clamps, 4–6 μ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone but some are thinner, 2–6 μ wide. (b) Fibre hyphae narrow, thick-walled, sometimes branching. (c) Gloeocystidia vesicular, globose to almost pyriform, thin-walled, 8–12 μ diameter.

Fructification.—(a) Gloeocystidia as above. (b) Basidia clavate with four sterigmata, 3–5 \times 18–24 μ . (c) Spores elliptical to almost cylindrical, hyaline, smooth, obliquely apiculate, 3 \times 5 μ .

Submerged mycelium.—Hyphae as in the advancing zone, crystals octahedral or amorphous and numerous.

S. purpureum has been described in pure culture by Cartwright and Findlay (3) who noticed the swollen hyphae or vesicles which are characteristic of this fungus. Talbot (20) considers these structures to be gloeocystidia so that they are listed under the numeral for gloeocystidia in the key. *S. purpureum* has a key pattern unlike that of any other species so that it should be readily identifiable in this way. The rather conspicuous gloeocystidia are a valuable guide in this matter.

This fungus is best known in South Africa as a parasite of fruit trees where it causes a disease with readily recognizable symptoms. It has, however, been reported from *Populus* sp. and *Quercus* sp. (10), so that its inclusion here may aid its recognition on hosts other than fruit trees.

13. *Stereum sanguinolentum* (Alb. and Schw. ex Fr.) Fr. (Pl. 3, Fig. 1; Pl. 5, Fig. 5.).

Key pattern: 2 1 1 4 9 2 2 2 2 2.

Growth characters.—Growth moderately rapid, the colony reaching a radius of 50 mm after fourteen days. The advancing zone is even, appressed, with sparse, thin, cottony mycelium extending to the limit of growth. The mat is at first white and downy and may remain so for some weeks, then turning "chamois" while it thickens to become cottony-floccose. At six weeks, the oldest parts are felty and coloured "light buff" to "capucine buff" or "yellow ochre". In some parts, especially near the edge, the mat is thin, skin-like and farinaceous or minutely granular. The mat remains soft and adherent to the agar and gives off a pleasant, sweet, mushroomy odour. The reverse remains unchanged or may turn "honey yellow".

On gallic and tannic acid media the diffusion zones are strong and about 30 mm in diameter, while the colonies grow to diameters of about 15 and 30 mm on gallic and tannic acid media, respectively.

Hyphal characters.

Advancing zone.—Hyphae hyaline, thin-walled, branched with simple septa and occasional large, simple clamps or paired clamps on the wider hyphae, 2–6 μ .

Aerial mycelium.—(a) Narrow hyphae with deeply staining contents and inconspicuous, simple septa or simple clamps, 1·5–5 μ wide. (b) Wide hyphae with granular contents, often with simple septa and multiple clamps present on the same hyphae, 3–6 μ wide. (c) Helicoid hyphae are fairly numerous, 2–3 μ .

Submerged mycelium.—(a) Hyphae as in the aerial mycelium. (b) Crystals large, octahedral.

This fungus causes collar and root rot of *Pinus taeda* in South Africa (14) but is also well known in North America as a cause of heart rot in coniferous trees. The South African strain fits the description by Nobles (16) very well, but the “conducting hyphae” with the swollen tips were not seen in culture, although they are present in the sporophores.

The most striking characteristics in culture are the presence of simple septa and multiple clamps in the same hyphae, the slow rate of growth and the thin mycelial mat. Its exclusive occurrence on coniferous trees, should aid in its identification from culture.

14. *Trametes cingulata* Berk. (Pl. 3, Fig. 2; Pl. 5, Fig. 6).

Key pattern: 1 1 1 1 9 1 2 2 1 (1, 2) 3.

Growth characters.—Growth is moderately fast, the colony reaching a radius of 38 mm in seven days and covering the plate after two weeks. The advancing zone is even and appressed for 1 mm behind the extreme limit of growth, the hyphae then becoming raised. The mat is white and remains so. Texture is at first thin, downy or downy-cottony, becoming sub-felty or chamois near the inoculum. Later it becomes appressed, downy, cottony, with farinaceous areas near or round the inoculum. Fruiting areas first appear as white or “light buff” farinaceous or granular specks which soon turn dull pasty and grow together to form irregular masses which develop irregular pores near the inoculum or over the youngest growth. The mat becomes tough, remains free of the agar and does not emit any odour. The agar is quickly bleached to clear, transparent, milky white.

On gallic and tannic acid media, there is no growth but a strong diffusion zone about 50 mm diameter is found on gallic acid and a small, weak one on tannic acid.

Hyphal characters.

Advancing zone.—Hyphae narrow, branched, nodose-septate with simple clamps of “eyelet” type, often branching from the clamps, 2–4 μ .

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae with thick, refractive walls, unbranched and without lumina, numerous, 1·5–5 μ . (c) Chlamydospores ovate elliptical to sub-globose, thick-walled, terminal, 4–8 \times 6–12 μ .

Fruit body.—Basidia pyriform with four sterigmata. Basidiospores hyaline, globose, 3·7–4 μ in diameter.

Submerged mycelium.—Hyphae as in the advancing zone.

Trametes cingulata could possibly be confused in culture with *Polyporus zonatus* which has the same key pattern in some forms. It appears, however, from Nobles’ description that *P. zonatus* has a thicker, denser mat than *T. cingulata* in cultures of six weeks old or less. *T. cingulata* is distinguished from other forms in nature by possessing a matt, black, upper surface to the sporophores. Cultures of this fungus were seen to develop this matt, black colour after 10–12 weeks in minute spots on the mycelium but visible only under 25 \times magnification.

15. *Trametes meyenii* (Klotzsch) Lloyd. (Pl. 3, Fig. 3; Pl. 5, Fig. 7.).

Key pattern: 1 1 1 1 9 2 2 1 1 2 3.

Growth characters.—Growth is rapid, a radius of 65 mm being reached in seven days, while the plate is covered in ten days. The advancing zone is even, appressed for about 1 mm, then raised. The mat is at first cottony to woolly but soon becomes more dense and compact to felty, until at six weeks it is very tough, felty, slightly lacunose over parts of the surface and faintly striate with fine grains on some parts of the surface. By this time, it is leathery in appearance and consistency. At first, the mycelium is translucent white but turns pure white as the mat becomes denser. After 3–4 weeks, a “pale cream color” band, about 15 mm wide, appears over the surface about half-way across the Petri dish. The agar is rapidly bleached as growth proceeds, becoming colourless. The cream coloured reverse of the mat is visible through the agar after 4–5 weeks.

Good growth takes place on gallic and tannic acid, a diameter of 40 mm being reached on the former and 65 mm on the latter medium in seven days. Strong diffusion zones are present in both media.

Hyphal characters.

Advancing zone.—Hyphae thin-walled, simple or with short side branches or unbranched, often branching from clamps, nodose-septate, clamps simple, “eyelet” type, 2–5 μ wide.

Aerial mycelium.—(a) Hyphae as in advancing zone. (b) Fibre hyphae with thick, refractive walls, no lumina, branched, without clamps or septa, 2–5 μ wide, very numerous. (c) Oidia cylindrical with rounded ends, hyaline, 2–4 \times 3–6 μ .

Submerged mycelium.—Hyphae branching profusely, thin-walled, nodose-septate with simple clamps as in advancing zone, 2–5 μ .

The key pattern of this fungus is unique so that there should be no difficulty in the identification of an otherwise featureless culture. The rapidly growing aerial mycelium, which becomes compacted into the white, tough mat, should hint at its identity. Although characteristic features are lacking, there should be no difficulty in recognizing the fast-growing, tough mat of this fungus if it has been seen previously.

In old cultures in tubes, fructifications were seen when the mat was placed in a vertical position for 2–4 months but no fructifications formed in less than six weeks.

T. meyenii has been reported on broad leaved trees and is a common saprophyte on hardwoods (10).

16. *Trametes proteus* (Berk.) Fr. (Pl. 3, Fig. 4; Pl. 5, Fig. 8.).

Key pattern: 1 2 1 1 0 2 2 2 1 (1, 2) 3.

Growth characters.—Growth is rapid, the colony covering 55 mm in seven days and the entire plate in less than two weeks. The advancing zone is even, raised, white and the mycelium cottony. The mat is at first cottony but soon becomes appressed and sub-felty with irregular translucent places on the surface. The sub-felty areas later turn farinaceous. About half-way across the mat, a raised band of cottony mycelium may form which turns brownish after 3–4 weeks. On the sides of the dish and other places, fructifications form which start as areas of compacted, white mycelium, which later turn brown, and develop large, incomplete pores. Some areas may remain white or the entire culture may become overgrown with the cottony, brown hyphae. The agar is quickly bleached and the mat gives off a pleasant, fragrant, mushroomy odour.

On gallic and tannic acid media, there are strong diffusion zones after one week. No growth takes place on gallic acid in seven days. On tannic acid medium, the colony may reach a diameter of 35 mm in seven days, or no growth may occur.

Hyphal characters.

Advancing zone.—Hyphae simple or branched, hyaline, septate with simple clamp connections of the "eyelet" type occasionally branching from the clamps, 2–5 μ wide.

Aerial mycelium.—(a) Hyphae as in the advancing zone. (b) Fibre hyphae brown with thick walls and narrow lumina, aseptate, often branching but mostly simple, numerous, long, 2–5 μ wide. (c) Hyphae encrusted with crystals but not very numerous; 4–6 μ .

Fruit body.—(a) Basidia clavate to obpyriform with four sterigmata, 18–24 \times 6–10 μ . (b) Basidiospores hyaline, ovate to almost elliptical, obliquely apiculate, 3–4.5 \times 7.5–10 μ .

Submerged mycelium.—Hyphae as in the advancing zone but more richly clamped and branched, often with numerous, short, lateral branches.

The key pattern for *T. proteus* is unique so that cultures may be identified by direct consultation of the key. Indeed, the rapid growth of the felty mat, with its brown, tangled overgrowth of fibre hyphae that soon tend to form fructifications, are so characteristic, that cultures may be identified without recourse to microscopic examination, if this species has been seen in culture previously.

DISCUSSION.

It is evident that in identifying these fungi from culture, a very important consideration must always be their micromorphology. In the introduction to this paper, it was stated that identification from cultures must go directly to the species, because species in the same genus do not show common generic characters in culture. In the *Polyporaceae*, this is very noticeable if the fungi are named according to the traditional classification of Fries and others, based on external morphology. However, Cunningham (5), basing his work on the original observations of Corner (4), has recently proposed a classification of the polypores which groups the fungi according to the colour and morphology of the hyphae, and the type of basidium present. When Cunningham's system is applied, it is found that cultures of polypores do show certain microscopic features which characterise the genus. It was observed during the course of this work that the fungi described here as *Polyporus sanguineus*, *Polystictus hirsutus*, *Trametes cingulata* and *Trametes meyenii* all have hyaline, generative hyphae with clamps at the septa, hyaline, long, narrow, thick-walled fibre hyphae (or "skeletal" hyphae) and clavate basidia. These species are all grouped by Cunningham (6) under the genus *Coriolus*. On the other hand, *Trametes proteus* differs from these in possessing brown fibre hyphae. These brown hyphae distinguish the genus *Trametes* from *Coriolus* in Cunningham's classification.

Binding hyphae, which characterise those polypores with trimitic hyphal systems, were never seen in culture so that it is impossible to distinguish between dimitic and trimitic genera with hyaline hyphae. Nevertheless, Cunningham's system of classification does help to group cultures of polypores with common generic features and thus aids in the identification of an unknown polyporoid culture.

In the lower Hymenomycetes, a similar system of classification based largely on microscopic features, is being worked out, (Cunningham 7). As in the *Polyporaceae*, fungi grouped according to this system should show common generic features in culture. It appears, however, that many of the structures present in the fructifications of wood-rotting fungi, are not formed in the cultures. For this reason, the work of Cunningham is unfortunately of limited use in the identification of unknown cultures.

More recently, Pinto-Lopes (17) also proposed a classification of the *Polyporaceae*, based on their hyphal characteristics. He stated (p. 116), that the same types of hyphae are produced in culture as are present in the fructifications. His descriptions are, unfortunately, not sufficiently detailed for use in the identification of unknown polyporoid cultures.

In this paper, the traditional nomenclature for the *Polyporaceae* was adhered to for the sake of uniformity with earlier work and because the South African species have not yet been revised in the light of the new approach.

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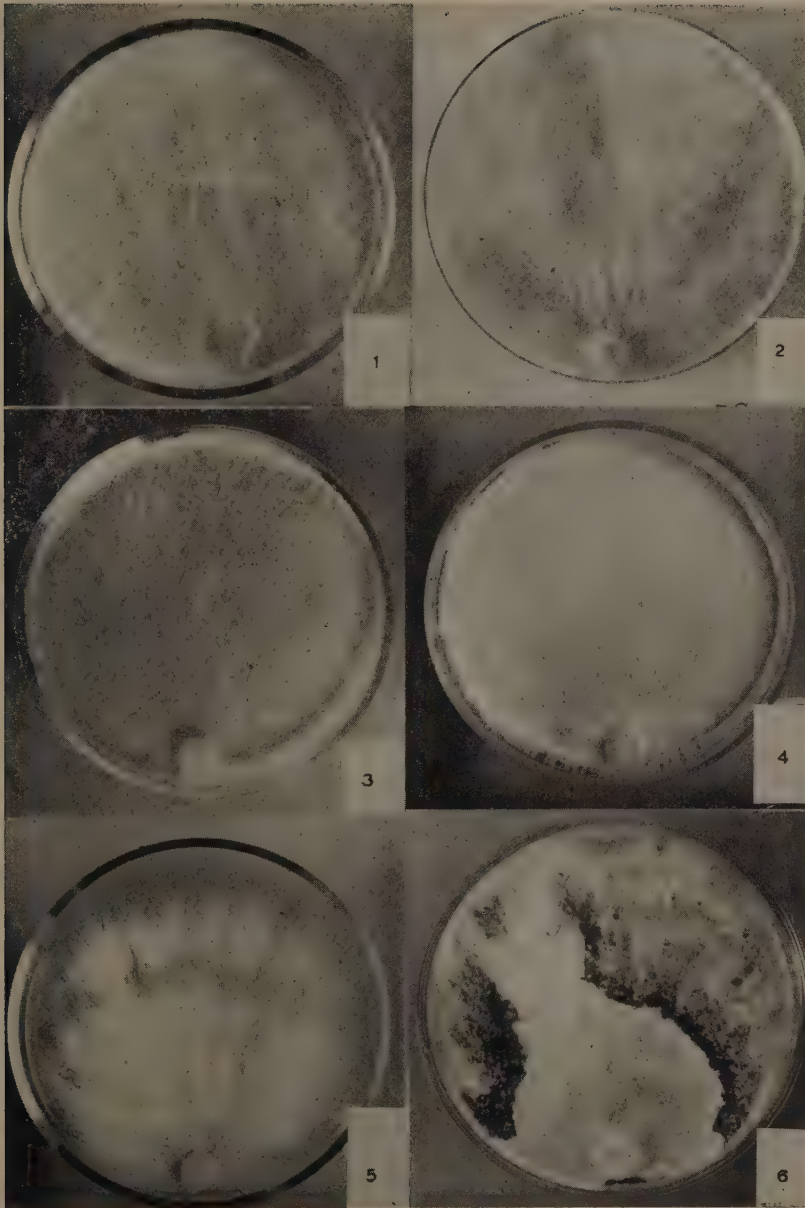


PLATE 1.—FIG. 1, *Amauroderma rude*, 2 weeks; FIG. 2, *Coniophora arida*, 3 weeks;
FIG. 3, *Ganoderma colossum*, 3 weeks; FIG 4, *Lentinus sajor-caju*, 2 weeks;
FIG. 5, *Lenzites palisoti*, 2 weeks; FIG. 6, *Polyporus arcularius*, 3 weeks.

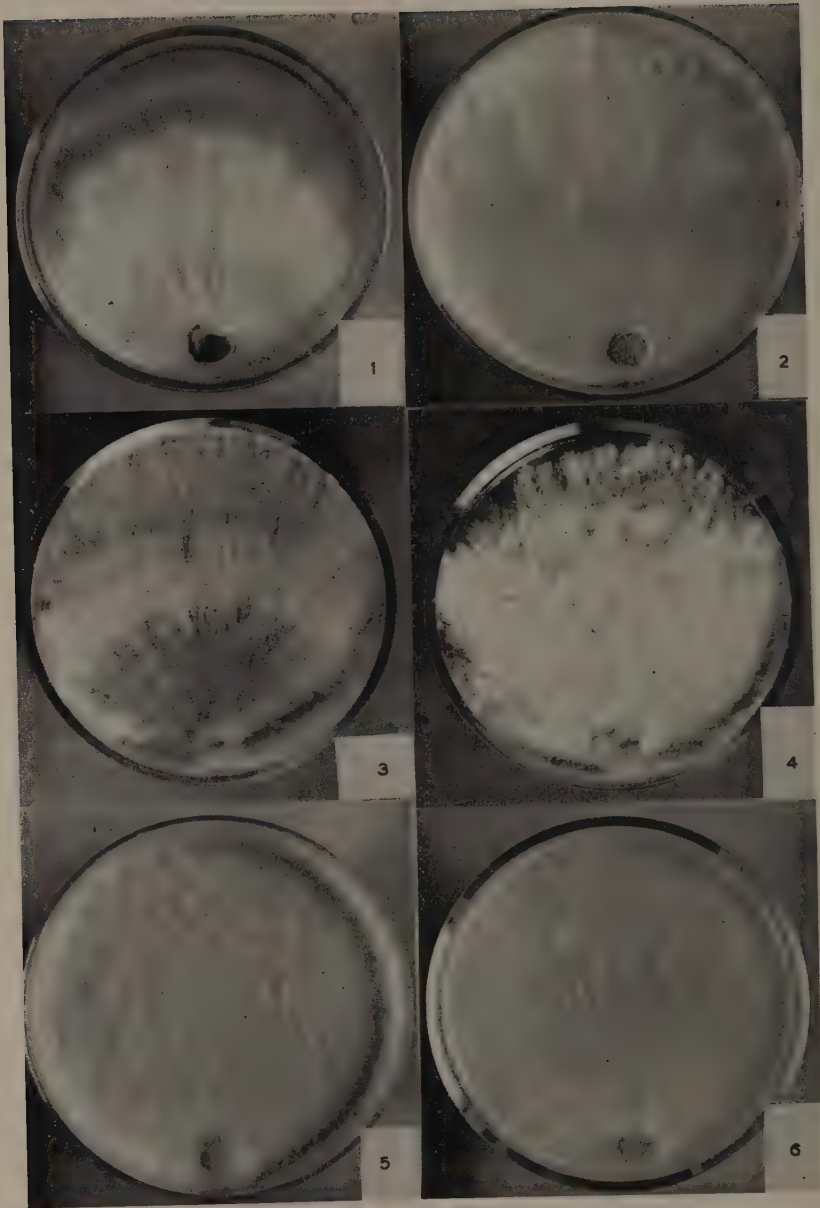


PLATE 2.—FIG. 1, *Polyporus sanguineus*, 2 weeks; FIG. 2, *Polystictus hirsutus*, 2 weeks;
 FIG. 3, *Poria vaillantii*, 3 weeks; FIG. 4, *Schizophyllum commune*, 3 weeks;
 FIG. 5, *Stereum hirsutum*, 2 weeks; FIG. 6, *Stereum purpureum*, 2 weeks.

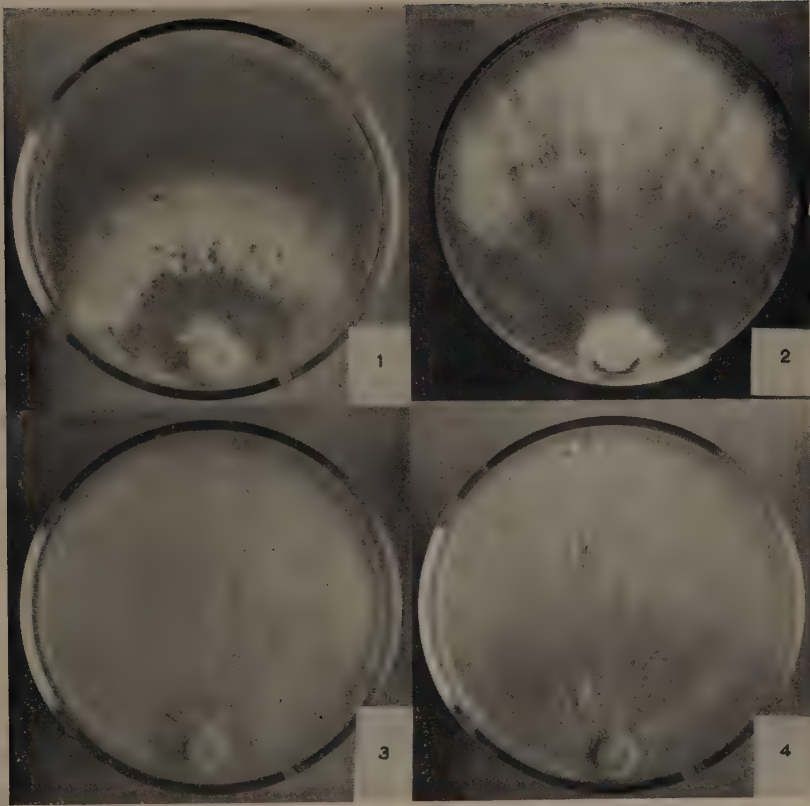


PLATE 3.—FIG. 1, *Stereum sanguinolentum*, 3 weeks; FIG. 2, *Trametes cingulata*, 3 weeks; FIG. 3, *Trametes meyenii*, 2 weeks, *Trametes proteus*, 2 weeks.

PLATE 4.

- FIG. 1.—*Amauroderma rude*: (a) Advancing hypha. (b) Aerial hypha. (c) Fibre hyphae with swellings. (d) Wide hypha with thick walled fibre hyphae branching off. (e) Terminally inflated fibre hyphae from crustose areas.
- FIG. 2.—*Coniophora arida*: (a) Advancing hyphae with multiple clamps and whorl of branches from clamps. (b) Aerial hypha with multiple clamps. (c) Aerial hypha with simple and multiple clamps. (d) Submerged hypha.
- FIG. 3.—*Ganoderma colossum*: (a) Advancing and aerial hyphae. (b) Widened hyphae with simple septa and deeply staining contents. (c) Thin-walled narrow hyphae without clamps and few simple septa.
- FIG. 4.—*Lentinus sajor-caju*: (a) Advancing and aerial hyphae with clamps. (b) Fibre hyphae. (c) Chlamydospores. (d) Thick-walled, swollen hyphae from crustose layer. (e) Submerged hypha with chlamydospore.
- FIG. 5.—*Lenzites palisoti*: (a) Advancing and aerial hyphae. (b) Fibre hyphae. (c) Fibre hyphae with wide lumen at tips. (d) Oidia. (e) Chlamydospore. (f) Submerged hypha.
- FIG. 6.—*Polyporus arcularius*: (a) Advancing and aerial hyphae. (b) Fibre hyphae. (c) Thick-walled brown hyphae from skinlike areas. (d) Basidia and basidiospores.
- FIG. 7.—*Polyporus sanguineus*: (a) Advancing and aerial hyphae. (b) Fibre hyphae. (c) Chlamydospores. (d) Submerged mycelium with chlamydospores.
- FIG. 8.—*Polystictus hirsutus*: (a) Advancing and aerial hyphae. (b) Fibre hyphae. (c) Submerged hyphae. (d) Oidia. (e) Basidium and basidiospores.

PLATE 4



Fig. 1

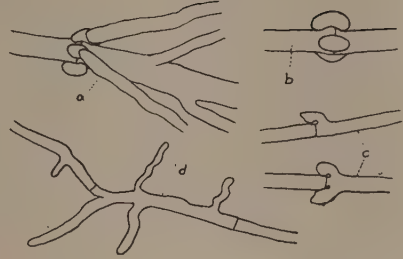


Fig. 2

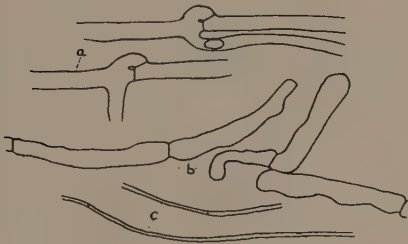


Fig. 3



Fig. 4

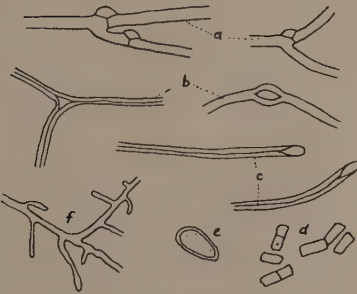


Fig. 5

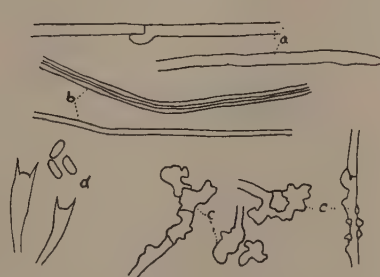


Fig. 6

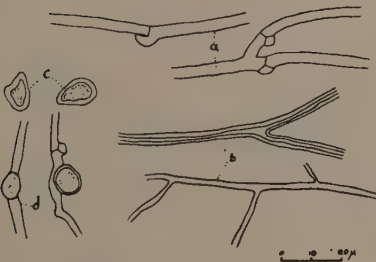


Fig. 7

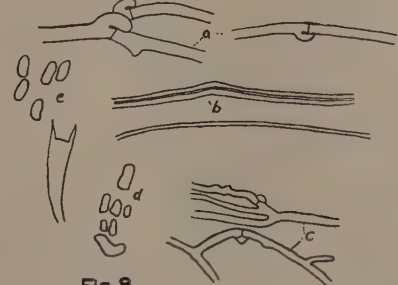


Fig. 8

PLATE 5.

- FIG. 1.—*Poria vaillantii*: (a) Advancing hyphae. (b) Aerial hyphae. (c) Wide irregularly distended hyphae. (d) Fibre hypha. (e) Basidia and basidiospores.
- FIG. 2.—*Schizophyllum commune*: (a) Advancing hypha. (b) Chlamydospores. (c) Hyphae with short, narrow side branches. (d) Submerged mycelium. (e) Basidia and basidiospores.
- FIG. 3.—*Stereum hirsutum*: (a) Advancing and aerial hyphae with multiple clamps. (b) Fibre hyphae. (c) Helicoid hyphae.
- FIG. 4.—*Stereum purpureum*: (a) Advancing hyphae. (b) Wide hypha from aerial mycelium. (c) Vesicular gloeocystidia. (d) Basidia and basidiospores.
- FIG. 5.—*Stereum sanguinolentum*: (a) Advancing hyphae. (b) Wide hyphae with simple septa and paired clamps. (c) Helicoid hyphae.
- FIG. 6.—*Trametes cingulata*: (a) Advancing and aerial hyphae. (b) Fibre hyphae. (c) Chlamydospores. (d) Submerged hypha. (e) Basidia and basidiospores.
- FIG. 7.—*Trametes meyenii*: (a) Advancing and aerial hyphae. (b) Fibre hyphae. (c) Submerged hypha. (d) Oidia.
- FIG. 8.—*Trametes proteus*: (a) Advancing hyphae. (b) Fibre hyphae. (c) Encrusted hypha. (d) Submerged mycelium. (e) Basidia and basidiospores.

PLATE 5

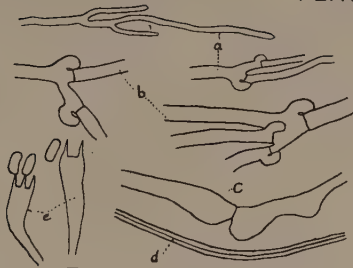


Fig. 1

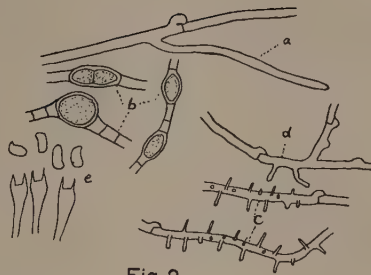


Fig. 2

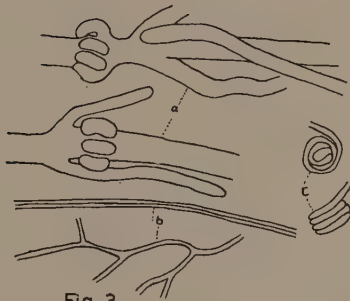


Fig. 3

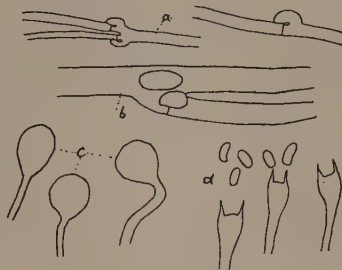


Fig. 4

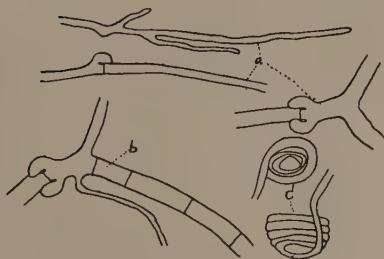


Fig. 5

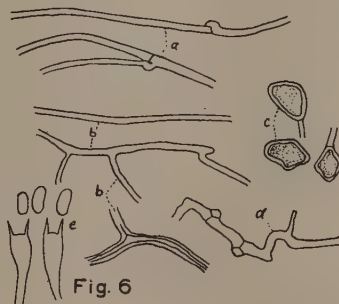


Fig. 6



Fig. 7

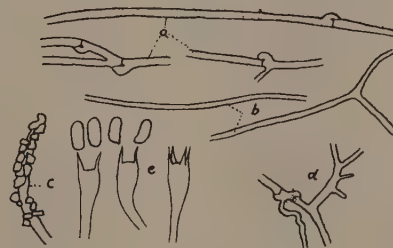


Fig. 8

New and Interesting Records of South African Fungi. Part iii.*

By

P. H. B. Talbot.

1. *Schizostoma laceratum* Ehrenb. ex Lev.

This species has previously been recorded only from equatorial Africa, Australia, India (Cunningham, 1944) and California (Lloyd, 1923). Mr. J. P. H. Acocks, who has a remarkable flair for finding rare Gasteromycetes, recently made a fine collection of twenty-two fructifications of this species on a sandy slope below Jan Swartsberg, 25 miles west of Williston, 30/vii/1956 (Acocks, A. 18917; PRE. 41592). The fungus was stated to be frequent in that locality.

The species is readily identifiable from Cunningham's description. Published photographs of the species show only one or two specimens, which are sometimes incomplete. Thus it seems desirable to publish the accompanying photograph (Fig. 1) which, in the original at least, gives a very good idea of the structure of this attractive and unmistakeable fungus.

The exoperidium is a sand-hyphal layer, fugitive except at the base. The endoperidium is umber brown, hard, papyraceous, polished, pitted, and dehisces by means of irregular splits from the apex downwards. The stipe, somewhat paler than the endoperidium, is socketed to the base of the peridium, and has a small semi-volvate mycelial pad at the base and also longitudinal striae and ill-defined appressed scales. The gleba is coloured deep umber with a purplish tinge. The capillitium threads are short, yellowish, non-septate, thin-walled, with characteristic short lateral branches with rounded ends. The spores are brown, smooth, subglobose, 4·5–6 μ diameter.

2. *Aseroë rubra* La Bill. ex Fries.

Although this species was described by Miss Bottomley (1948, p. 526), its occurrence in South Africa has hitherto been doubtful. The only known record was a specimen in Herb. Kew. collected by W. T. Saxton in Cape Town, which Miss Bottomley thought might have been confused with *Anthurus archeri*. It was therefore most interesting to receive indubitable specimens of *Aseroë rubra* collected by Mr. M. J. Howell in a plantation of *Acacia mollissima* at Otto's Bluff, Natal, on 2/ii/1957 (PRE. 41735), and again at Richmond, Natal, on 10/x/1957 (PRE. 41746). The first of these collections is illustrated in Fig. 3.

Miss E. L. Stephens informs me that 15 to 20 specimens of *A. rubra* were found growing close together on the farm Die Hoek, Swellendam C.P., by Miss D. Hermans and Mr. C. Steytler on 16/iii/1958 (Herb. E. L. Stephens No. 1845).

* Parts I and II of this paper appeared in *Bothalia* 6 (1951) 183–204 and *Ibid.* 6 (1956) 489–500 respectively.

3. *Chlamydompus meyenianus* (Klotzsch) Lloyd.

There is only one previous record of this species for South Africa (Bottomley, 1948, p. 625), for which no details of locality and collector were available. The species has been found again by Mr. J. P. H. Acocks on the ground at Pampoenoport, C.P., 29/x/1954 (Acocks, 17842; PRE. 41007). It is illustrated in Fig. 2.

4. *Battarea stevenii* (Liboschitz) Fries.

This species is well illustrated and described by Miss Bottomley (1948, p. 620) who examined several South African collections. Four unusually fine specimens emerged in the grounds of the Division of Botany, Pretoria, in October 1950, (leg. P. H. B. Talbot; PRE. 39098) and provided an opportunity to take the accompanying photograph (Fig. 4). This supplements Miss Bottomley's illustrations by showing clearly the nature of the gleba before dehiscence of the peridium. The specimens appeared on a roadside which had been filled in a few months previously with very hard soil containing large pieces of shale, which were lifted and pushed aside by the fungus as it broke through the surface. About half of the stipe was underground. The fungus has not been seen there since.

5. *Helicosporium aureum* (Corda) Linder.

This attractive species was collected by Dr. A. L. James on a beam of imported southern pine which had been stacked for sixteen months in the open at Brakpan Mines Ltd., 8/v/1952 (T.R.L. 2900; PRE. 41738). It is superbly illustrated by Linder (1929, p. 279).

The fungus forms an olive-yellowish, loose, cottony layer which is separable from the substratum. The conidiophores are erect, brown, septate, 300–400–(700) μ in length and 6–7 μ wide at the base, tapering and becoming paler towards the apex. They are simple at first but later branch at right angles in the upper half to two-thirds of the conidiophore. Conidia are borne pleurogenously on hyaline bladder-like swellings, 6–9 μ long, which arise laterally on the lower part of the conidiophores. The conidia are hyaline to very pale yellowish, indistinctly multiseptate, coiled $3\frac{1}{2}$ times in one plane. The coiled conidium is up to 22 μ in diameter and its filament is 1–2 μ wide.

Among the helicosporous fungi imperfecti this species is easily recognised by its erect brown conidiophores which branch above at right angles, and by its coiled conidia borne on terminal spicules of bladders which occupy the lower part of the conidiophore.

6. *Tilletia ehrhartae* sp. nov.

Sori nigri in ovariis *Ehrhartae calycinae*. Sporae verrucosae fuscae globosae vel subglobosae, 19–24 μ diam.; verrucae rotundae ad 1.5 μ altae. Typus PRE. 41604, leg. R. Story (6006).

Sori black, occupying the ovaries of *Ehrharta calycina*; spores dark-coloured, globose to subglobose, 19–24 μ diam., including the verrucose epispore composed of rounded warts up to 1.5 μ high. Type R. Story (6006), on *Ehrharta calycina*, Nature Reserve, Lambert's Bay, Clanwilliam distr., Oct., 1956.

Dr. M. B. Ellis of the Commonwealth Mycological Institute has favoured me by comparing this collection with the type of *Tilletia verrucosa* Cooke & Masee, the only other *Tilletia* yet reported on *Ehrharta* (Zundel, 1953, p. 301). In *T. verrucosa* the spores are 20–24 μ diam. (including the warts); they are very much paler than those of *T. ehrhartae* and the warts are 3–4 μ long and acute at their tips. The contents of the sori are also much paler in *T. verrucosa*.

7. *Thecaphora bulbinellae* sp. nov.

Sori in floribus celati ovaria perdentes; Cumulus sporarum granulosus niger; Columella nulla; Glomeruli sporarum stabili fuscis subglobosi vel ellipsoidei, 24–54 μ diam., sporis 20 vel multis; Sporae globosae vel subglobosae vel ellipsoideae vel nonnihil angulatae, (4.6)–7.7–12.3 μ maximo diametro, leves fuscae crasse tunicatae; Epispora crassitudine 0.5–1.5 μ .

Sori enclosed by the flowers and destroying the ovaries. Spore mass granular, black. Columella absent. Spore-balls permanent, brown, subglobose to ellipsoid, 24–54 μ diam., containing from 20 to numerous spores. Spores firmly united, globose, subglobose, ellipsoid or somewhat angular, (4.6)–7.7–12.3 μ in greatest diameter, yellow-brown to reddish-brown, thick-walled, the epispora 0.5–1.5 μ thick, smooth on both the united and free faces of the spores. On Liliaceae: Type PRE. 41745, leg. J. Toxopeus on *Bulbinella setosa* (Willd.) Dur. & Schinz, Struben's Valley, Pretoria, 24/vi/57.

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FIG. 1.—*Schizostoma laceratum* $\times 5/6$.

[Photo: H. King.]



Above: FIG. 2.—*Chlamydopus meyenianus* $\times 1$.

[Photo: J. Reyburn.]

Below: FIG. 3.—*Aseroë rubra* $\times 1$.

[Photo: J. Reyburn.]



FIG. 4.—*Battarea stevenii* $\times 1/2$.

[Photo: H. King.]

The Genera *Craterellus*, *Cymatoderma* (*Cladoderris*) and *Thelephora* in South Africa.

By

P. H. B. Talbot.

CRATERELLUS Persoon.

1. *Craterellus cornucopioides* (Linn. ex Fr.) Pers., Myc. Eur. 2 (1825) 5; Doidge in *Bothalia* 5 (1950) 483.

Peziza cornucopioides Linn., Sp. Plant. (1753) 1181.

Cantharellus cornucopioides Linn. ex Fr., Syst. Myc. 1 (1821) 321.

FIG. 1.

Fructifications single or caespitose, about 4.5 cm high and 2.5 cm diam. at the apex, thin, membranous, drying brittle, trumpet-shaped, tapered to the base, hollow to the base of the stipe. Hymenium on the outer side, cinereous when moist, drying brownish to yellow-brown and black at the base, smooth, becoming longitudinally wrinkled, subgelatinous, drying corneous. Abhymenial surface deep smoky brown, becoming almost black, squamulose. Margin often darker than the rest, usually curved downwards, sometimes erect, lobed. Stipe hollow, black, smooth, glabrous, up to 5 mm diam.

Basidia: long clavate or subcylindrical, $6-9 \times 50-70 \mu$, with 2-4 sterigmata.

Spores: hyaline, smooth, elliptic-oblong, with a small lateral apiculus, $6.5-8-(9.6) \times 12-14-(16.5) \mu$.

Specimens examined: 10456 (J. M. Wood, 4108), *J. Blake*, Harrison, Natal.

This is the only species of the genus to have been recorded in South Africa, and the above specimen is the only one yet found. The basidia and spores were clearly seen and were quite typical of this species. Other microscopic characters were indistinct.

The systematic position of *Craterellus* is likely to remain speculative until the Aphyllophorales have been more critically examined by hyphal analysis and by comparison of other microscopic features. A recent view of *Craterellus* is to place it in the Cantharellaceae (Singer in *Lilloa* 22, 1949, 730), a family supposedly related rather to the Clavariaceae than to the Agaricaceae or Thelephoraceae where it has formerly been classed.

I have here considered *Craterellus* with the Thelephoraceae because it has been so recorded in previous South African literature and because my present object is to examine the validity of these specific and generic records.

CYMATODERMA Jungh.

The name *Cladoderis* Pers. ex Berk., a later synonym of *Cymatoderma* Jungh., has almost exclusively been used for this genus in the past, and was proposed for conservation against *Cymatoderma* (Donk in Bull. Bot. Gard. Buitenzorg ser. iii, 18, 1941, pp. 156 and 163). This proposal was defeated at Congress (Taxon 2, 1953, 31). The type species of the genus is *Cymatoderma elegans* Jungh.

The little that is known of the genus is mainly summarised in Fries' "Fungi Natalenses" (1848) and in Lloyd's "Synopsis of the Genus *Cladoderis*" (Lloyd Myc. Writ. 4, 1913).

Cymatoderma is evidently closely related to *Stereum*, especially through such species as *Stereum involutum* (Klotzsch) Fr., but differs from *Stereum* in the possession of a radially ribbed and usually papillate hymenium. With the exception of *Cladoderis funalis*, the species of *Cladoderis* or *Cymatoderma* are rather uniform in microscopic characters, having a dimitic hyphal system, hyaline spores, and usually cystidia and/or gloecystidia showing respectively little variation from species to species. But macroscopically the species are bewilderingly variable. The specific distinctions have always been based almost entirely on the external appearance without adequate investigation of the microscopic features and without sufficient regard for the natural variations and intergradations that are possible in such characters as hairyness, colour and habit. Owing to variation these characters are undoubtedly of minor importance and the emphasis laid on them originally resulted in an unnecessary number of species being proposed. Recognising this fact to some extent, Lloyd was able to accept only five 'good' species out of some twenty-five that had already been described. Lloyd noted that the mode of insertion of the stipe was of no specific value, and stated that the characters of value were: (1) the nature of the hymenial folds, whether broad and obtuse or narrow and sharp, (2) the presence or absence of papillae (but then admitted that these were not a constant feature), and (3) the tomentose upper surface, whether densely or scantily clothed with hairs.

It is instructive to quote fairly extensively from Lloyd's comments on some of the species which he differentiated, which show clearly that the above characters are actually of little taxonomic value owing to variation and intergradation, and secondly that any attempt to key out species entirely on such characters is likely to fail:—

**Cladoderis dendritica*: "Papillae usually none, but many specimens occur with a few." . . . "I believe that . . . *C. elegans* is in reality only an excessively warty form (of *C. dendritica*) for while the type forms are so different (apparently) there are many connecting specimens in the museums."

**Cladoderis elegans*: "As to colour, variation as to form and stipe characters, and very often as to the even, thick tomentum pad on the pileus, *elegans* is similar to *dendritica*, but *elegans* has the narrow folds of the hymenium densely covered with papillae" . . . "And the hymenium folds, while narrow, are more the nature of those of *Cladoderis spongiosa*, and specimens occur connecting it with *spongiosa*, rather than with *dendritica*."

**Cladoderis spongiosa*: "Nor is the distinction between it and *Cladoderis elegans* strongly marked, for the nature of the (hymenial) folds is not an absolute character, and many specimens occur that appear to be intermediate."

**Cladoderis infundibuliformis*: "All the preceding species might be broadly considered as forms of the same species, but this is widely different, in having a darker colour, thin, ridged pileus, slight tomentum" . . . "Usually the tomentum is but slightly developed, or almost none, but it is a varying character as shown in specimens at Kew of the same collection."

TABLE 1.

Microscopic organs of various species of *Cymatoderma* (*Cladodermis*): Measurements in μ .

Species.	Cystidia.	Gloeocystidia.	Spores.	Hairs.	Hyphae.
<i>C. elegans</i>	14-17 \times 35-45	6-11 \times 35-55	3.2-3.7 \times 6.5-8.3	3-5	3-5; dimitic.
<i>C. spongiosa</i>	9-14 \times 20-50	9-13 \times 28-55	3.2-4.8 \times 6.4-9.5	4-6	3-6; dimitic.
<i>C. australica</i> ...	6.6-13 \times 20-40	9-12 \times 25-60	3.2-5.0 \times 6.4-9.6	4-6	2.5-5; dimitic.
<i>C. infundibuliformis</i>	9-15 \times 25-40	8-15 \times 30-45	3.3-4.0 \times 6.7-8.6	4-5	3-5; dimitic.
<i>C. dendritica</i> ...	Nil.	8-13 \times 30-75	3 \times 4 or 3-4 diam.	5-6	3-7; dimitic.
<i>C. funalis</i>	Nil.	Nil.	4.8-6.4 \times 6.4-8.0	3-5	3-9; monomitic.

The taxonomy of this genus must undoubtedly be based primarily on microscopy (see Table 1; cfr. Figs. 2-7). If this is done, *C. dendritica* may be separated from the other species mentioned above by its distinctively smaller and rounder spores and by its lack of cystidia, features mentioned also by Burt (in Ann. Mo. Bot. Gard. 11, 1924, 3). All the other species quoted above have spores, cystidia and gloeocystidia of essentially the same size and shape respectively, and cannot be separated microscopically. The precise configuration of the hymenium, as Lloyd showed, is variable and intergrades, and in any case this character has frequently been demonstrated as unreliable in taxonomy. The development of the surface hairs varies considerably in specimens of a single collection, and hairs may easily rub off with age or be destroyed by insects. The thinner pileus and darker colour of *C. infundibuliformis* is mainly due to the fact that the hairs are scanty. If the hairs be removed from a specimen of *C. spongiosa*, the surface is seen to be dark in colour and composed of radiating, acute ridges not essentially different from *C. infundibuliformis*. To the writer only one macroscopic character so far appears to be of definite specific value, namely whether as in *C. funalis* P. Henn. the pileus is deeply dissected into narrow radiating segments. But as will be seen later, this species is probably better referred to the Clavariaceae under *Clavulina* or *Aphelaria*.

The species that have been studied may be grouped as follows:—

- (A) Pileus deeply dissected into narrow radiating segments. Hyphae monomitic. Cystidia and gloeocystidia absent. Basidia bisporous to quadrisporous. Spores 4.8-6.4 \times 6.4-8 μ . *C. funalis*.
Pileus entire to shortly incised or laciniate at the margin. Hyphae dimitic. Cystidia and/or gloeocystidia present (B).
- (B) Gloeocystidia present, cystidia absent. Spores \pm subglobose, 3 \times 4 μ or 3-4 μ diam. *C. dendritica*.
Both gloeocystidia and cystidia present. Spores ellipsoid, 3-5 \times 6-10 μ .
The *C. elegans* Complex (C).
- (C) Pileus surface densely covered by a thick, whitish, pad-like tomentum.
(a) Hymenial ribs narrow *C. elegans*.
(b) Hymenial ribs broad, obtuse *C. spongiosa*.
Pileus surface scantily tomentose, light red-brown or yellow-brown. *C. infundibuliformis*.
Pileus surface almost devoid of hairs when mature, and dark red-brown to fuscous in colour. *C. australica*.

This last group of four names (the *C. elegans* Complex) has been subdivided above in accordance with the old concept of the species concerned, where extremes in macroscopic form were recognised. But there is little doubt that all these species are variations of a single species, whose earliest epithet is *elegans*, and that the variations intergrade so much that it would not be practicable to recognise varieties of *C. elegans* based on those macroscopic features. I propose therefore that *C. spongiosa*, *C. infundibuliformis*, and *C. australica* should be regarded as synonyms of *C. elegans* Jungh.

Notes on South African Records of *Cymatoderma* (*Cladodermis*).*

The species of *Cymatoderma* and *Cladodermis* that have been recorded for South Africa will now be reviewed. Accepted species are printed in bold type, synonyms or dubious records in italics. I am much indebted to the Director of the Royal Botanic Gardens, Kew, and to the Director of the South African Museum, Cape Town, for the loan of some specimens. I wish also to record my thanks to Mr. D. A. Reid of Kew Herbarium for helpful discussion of some of the problems involved.

1. *Cladodermis australis* Kalchbr. f. *minima* Bres.

There is a specimen in Kew labelled "*Cladodermis australis* Kalchbr. f. *minima*. Specimen authenticum", in Kalchbrenner's writing. The word "Cape" and Bresadola's signature also appear on the label. Although I have not been able to trace whether Bresadola ever published his f. *minima*, and it is probably only a herbarium name, yet this specimen requires comment in view of the similarity of the epithets of *C. australis* and *C. australica* and another species *Cladodermis minima* C. & Br.

The specimen is not a *Cymatoderma* but instead a good match with *Stereum thozetii* Berk. According to Lloyd (Syn. Stip. Stereum 1913, 28) a specimen which he assumes to be the original of *C. australis* Kalchbr. is *Stereum elegans* Mey.

2. ***Cymatoderma elegans*** Jungh. in Tijdschr. Nat. Gesch. Phys. ed v. d. Hoeven & De Vriese 7 (1840) 390; Montagne in Ann. Sci. Nat. 7 (1847) 173.

Cladodermis elegans (Jungh.) Fries, Fungi Natalenses (1848) 22; Doidge in Bothalia 5 (1950) 480.

Cladodermis spongiosa Fries (!), Fungi Natalenses (1848) 20; Saccardo, Syll. Fung. 6 (1888) 548; Lloyd, Syn. Gen. Cladodermis (1913) 5, f. 526; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 51, f. 17; Doidge in Bothalia 5 (1950) 480.

Cladodermis spongiosa Fr. var. *subsessilis* Fr., Fungi Natalenses (1848) 21; Doidge in Bothalia 5 (1950) 480.

Actinostroma infundibuliforme Klotzsch, Fungi in Meyen, Beiträge zur Botanik, gesammelt auf einer Reise um die Erde (1843) 237.

Cladodermis infundibuliformis (Kl.) Fries, Fungi Natalenses (1848) 21; Doidge in Bothalia 5 (1950) 480.

Cladodermis australica Berk. ex Saccardo, Syll. Fung. 6 (1888) 548; Cooke, Handbk. of Australian Fungi (1892) 181, f. 76; As *C. australica* Berk. in Herb., Cooke in Grevillea 8 (1879) 70, *nom. nud.*; *ibid.* 9 (1880) 14, *nom. nud.*; *ibid.* 11 (1882) 28, *nom. nud.*

FIGS. 2, 4-6.

* Deur die goedgegunstigheid van die Universiteit van Stellenbosch is ek toegelaat om sekere eksemplare in die Herbarium P. A. van der Byl te ondersoek. Verwysing na verskillende soorte in die Van der Byl-Herbarium word hieronder gemaak.

Pileus flabellate to infundibuliform, substipitate or attached by a short central, excentric or lateral stipe. Surface radially ridged, the ridges sharp, sublamellate, varying from nearly glabrous and somewhat zonate to thickly covered with a dense whitish, later discoloured, pad-like tomentum and azonate; the ridges yellow-brown to light reddish-brown to dark red-brown (near Carob brown or Chestnut of Ridgway). Margin entire or slightly incised. Hymenium creamy to light buff, radially costate, the ribs varying from narrow and sharp to broad and obtuse, almost smooth or strongly papillate or tuberculate.

Basidia: Clavate, $25-45 \times 6 \mu$.

Spores: $3.2-5 \times 6.4-9.6 \mu$, hyaline, smooth, elliptical, sometimes unilaterally depressed.

Cystidia: smooth, rarely with a minutely encrusted apical portion, hyaline, very thick-walled, fusiform, mammiform or pyriform, often with a small apical protuberance, $(6.6)-8-17 \times 20-50 \mu$, terminal in position.

Gloeocystidia: smooth, hyaline, with homogeneous deeply-staining contents, fusoid, pyriform or mammiform, or sometimes elongated and irregularly subcylindrical, $(6)-8-12-(15) \times 25-60 \mu$.

Hyphae: dimitic, hyaline. Skeletal hyphae thick-walled, smooth, $2.5-6 \mu$ diam.

Surface hairs: scanty to abundant, thick-walled, smooth, hyaline, with clamp connections, part of the generative hyphal system.

Specimens examined: As *C. elegans*: Herb. Hort. Bot. Bog. Java 2361 in Herb. Kew.; *P. W. Richards* 2258, Sarawak, in Herb. Kew. (Java is the *locus typicus* of this species). As *C. spongiosa*: Part of Type in Herb. Kew. marked by Fries "*Cladoderris spongiosa* Fung. Nat. fragmentum Cap. Nat."; *Farquharson* 47, S. Nigeria, in Herb. Kew.; Universiteit van Stellenbosch, Herbarium P. A. van der Byl nr. 319, 2085; National Herbarium, Pretoria Nos. 36864, 33142, 15554, 31344, 9149, 39079. As *C. infundibuliformis*: *Dümmer* 2108 and 3125, Uganda, in Herb. Kew.; Ex Papua, det E. M. Wakefield, in Herb. Kew.; *W. Small*, 471, Uganda; *Maitland* 1, 30 A, Uganda; *Holst* 2542, Usambara; National Herb., Pretoria No. 18045 and 13032 (*Dümmer* 2108), Uganda; Universiteit van Stellenbosch, Herbarium P. A. van der Byl nr. 522. As *C. australica*: *J. M. Wood* 239, Natal (In Herb. Kew. and in Herb. S.A. Museum No. 34303) neotype. As *Thelephora dendritica*: ex Gripps Land, Herb. Berkeley.

Under *Cladoderris elegans*, Doidge lists two collections by Drège from South Africa. It has been ascertained that neither of these is represented in Montagne's Herbarium in the Paris Natural History Museum.

Cladoderris spongiosa Fr. var *subsessilis* Fr. was described as having an excentric stipe, but, as Lloyd has shown, the characters of stipe insertion are not of taxonomic value in this genus.

There is a specimen in Herb. Kew. labelled "*Thelephora calix* Kze." in an unknown handwriting, and "*Thelephora dendritica* Fr. Africa austr. leg. Ecklon & Zeyher" by Berkeley. It corresponds with *Cladoderris spongiosa* microscopically, and macroscopically except that its hymenium is obviously discoloured.

Cladoderris australica Berk. ex Sacc. is a species with a curious and complicated history. Cooke first published this name in 1879, 1880, and 1882 as a *nomen nudum*, attributing the epithet to "Berk. in Herb." In 1888 Saccardo validated the name with a full description, citing it as "*Cladoderris australica* Berk. in Herb. et in Cooke Fungi Austral." The formal citation of this species should therefore be *Cladoderris australica* Berk. ex Sacc. Then in 1892 Cooke published a close translation of Saccardo's description and added a coloured figure. He cited the species as "*Cladoderris australica* Berk. in Herb.", and referred to Saccardo's description. There is no concrete evidence that Berkeley ever used *C. australica* as a herbarium name, but both Saccardo and

Cooke referred to a Berkeley specimen from New South Wales which, if it existed, would be the holotype. The only Berkeley specimen in the type folder of *C. australica* at Kew was labelled "*Thelephora dendritica*" by Berkeley, and came from Gipps Land. Gipps Land is now part of Victoria, but I am informed by Mr. D. A. Reid that prior to 1851 it formed part of New South Wales. The old boundaries would be difficult to define and no exact locality was given for this specimen, so one could perhaps accept this specimen as being the one from N.S.W. referred to by Saccardo and by Cooke. Berkeley, on the other hand, did not use the name *C. australica* for this specimen, and so one must assume that he used it for a specimen that is now lost; consequently a lectotype or neotype should be chosen. As there is no material in existence seen and classified by Berkeley as *C. australica* a lectotype is out of the question and a neotype should be nominated. Cooke's earlier mention of the species was in connection with the Natal collection of *J. M. Wood* No. 239, and there is little doubt that both Saccardo's and Cooke's descriptions, and the coloured figure, fit the Natal specimens rather than Berkeley's specimen from Gipps Land. Lloyd (Syn. Gen. Cladoderris 1913, 10) considered that the latter specimen matched *C. spongiosa* Fr., and I support that opinion. Consequently I consider that if another Berkeley specimen, now lost, had existed, it must have had the appearance of *J. M. Wood* 239, and I nominate the latter as the **neotype** of *Cladoderris australica* Berk. ex Sacc. I regard both *C. spongiosa* and *C. australica* as synonyms of *Cymatoderma elegans* Jungh. That a neotype for *C. australica* should be nominated, really only becomes a practical necessity if this synonymy should later be disputed.

It may be mentioned that the specimen of *J. M. Wood* No. 239 in the National Herbarium, labelled *Cladoderris thwaitesii*, is instead a species of *Favolus*, but that the part of this collection in Herb. S.A. Museum 34303 matches *Cladoderris australica* and the neotype in Kew.

3. *Cladoderris funalis* P. Henn. in Engler Jahrb. 38 (1905) 120; Saccardo Syll. Fung. 21 (1912) 385; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 52, f. 18; Doidge in Bothalia 5 (1950) 480.

FIG. 7.

Fructifications laterally stipitate, anastomosed and with somewhat fused stipes, more or less flabellate, 3 cm diam. and 1.5 cm high. Stipe 1.5–2 cm × 2 mm, compressed, rugulosely striate. Upper surface sterile, yellow-brown to pale reddish-brown, covered with tangled, thick, concolorous fibrils composed of fascicles of hyphae. Margin fimbriate to deeply dissected. Hymenium yellowish to brownish, covering broad, obtuse, radiating, branched ribs, not papillate, decurrent on the stipes.

Basidia: cylindric-clavate, 35–50 × 6–8 μ , with two to four sterigmata up to 4 μ long. Spores: hyaline, smooth, ovate to ellipsoid, finely apiculate, 4.8–6.4 × 6.4–8 μ .

Hyphae: thin-walled, hyaline, without clamps, septate, readily collapsing, in parts inflated, 3–9 μ wide. Hyphae composing the surface fibrils are similar, usually uninflated, 3–5 μ wide, adherent in fascicles.

Specimens examined: Universiteit van Stellenbosch, Herbarium P. A. van der Byl nr. 2465 (*Eyles* 5026), Salisbury, S. Rhod.

This collection agrees very well with Hennings' description and Lloyd's photograph (Syn. Gen. Clad., 1913, p. 10, Fig. 530) of the type, and appears to be correctly named as to species.

The dissection of the pileus at the margin is partly due to the running out of the hymenial ribs, and partly to their being continued into some of the surface fibrils. The fibrils are thick, sterile, and resemble hydroid spines. The hymenial ribs are broad, obtuse and not papillate. The spores are very abundant. No cystidia or other accessory organs are present. There is a monomitic hyphal system.

Writing of *Cladoderris funalis*, Lloyd said, "It is so different from all other species that it is a question if Hennings was correct in referring it to *Cladoderris*." Lloyd suggested an affinity with *Lachnocladium*, but that can be ruled out since *C. funalis* has no dichophytic hyphae.

Certainly *C. funalis* is far removed from other *Cladoderris* species by its monomitic hyphae which become inflated, by its bisporous to quadrisporous basidia, and by the lack of cystidia and gloecystidia. It seems certain that the ribbed hymenium is composed basically of flattened clavarioid branches which have fused into an unusual dorsiventral form. Except that the basidia are not all bisporous they and the other microscopic characters agree well with those of *Clavulina* as delimited by Corner (Monogr. of Clavaria and Allied Genera, 1950), and there are species in this genus which show flattened branching. Flattened branching is however more characteristic of the genus *Aphelaria* Corner in which the basidia are bisporous to quadrisporous; but the hyphae in *Aphelaria* are uninflated and tend to have thickened walls, which is not the case in *Cladoderris funalis*. Mr. D. A. Reid informs me that the type of *C. funalis* has basidia with four spores. *Cladoderris funalis* appears to have characters somewhat intermediate between those of *Clavulina* and *Aphelaria* but I am not in a position to decide to which of these genera it should be transferred.

4. *Cladoderris thwaitesii* Berk. & Broome; recorded by Kalchbrenner in Grevillea 10 (1881) 58; Saccardo Syll. Fung. 6 (1888) 550; Doidge in Bothalia 5 (1950) 480.

The collection which Kalchbrenner assigned to this species is J. M. Wood No. 239. This collection has been nominated above as the neotype of *Cladoderris australica* Berk. ex Sacc., which has here been reduced to synonymy under *Cymatoderma elegans* Jungh.

According to Petch (Ann. Roy. Bot. Gard. Perad. 9, 1924, 134) the true *C. thwaitesii* is a bleeding species of *Stereum*.

THELEPHORA Ehrhart ex Fries.

Many of the Thelephoraceae were originally described as species of *Thelephora* and have since been combined under other genera. The object of this section is to annotate all those species which have at some time been recorded for South Africa under the genus *Thelephora*.

1. *Thelephora (leijostroma) acerina* (Pers.) Pers. ex Fr., Syst. Myc. 1 (1821) 453; Persoon, Syn. Fung. (1801) 581, Myc. Eur. 1 (1822) 152; Léveille in Ann. Sci. Nat. ser. iii, 5 (1846) 150.

Stereum acerinum (Pers. ex Fr.) Fr., Epicrisis (1838) 554; Saccardo Syll. Fung. 6 (1888) 587.

As no material supporting Léveille's and Saccardo's records is available, it is not known whether this species is represented in South Africa. The species is referable to the genus *Aleurodiscus*, and a description and comment on it as a South African record is given by the writer (Bothalia 6, 1956, 466).

2. *Thelephora biennis* Fries, Syst. Myc. 1 (1821) 449; recorded by Kalchbrenner in Grevillea 10 (1881) 58.

This record is based on Kalchbrenner's determination of *MacOwan* (1244), collections of which have been examined at Kew Herbarium and in Herb. S.A. Museum (sub. *Stereum fuscum*, No. 34292). These specimens are *Stereum bicolor* (Pers. ex Fr.) Fr. Cfr. Bothalia 6 (1954) 308, f. 21.

3. *Thelephora (Stereum) fulva* L  veille (!) in Ann. Sci. Nat. ser. iii, 5 (1846) 149.

The type of this species, Dr  ge (9441), Cap-de-Bonne-Esp  rance in Herb. Mus. Paris, was examined and is annotated under *Stereum fulvum* (Lev.) Sacc: See Bothalia 6 (1954) 315, f. 20.

4. *Thelephora fuscoviolascens* Mont. in Ann. Sci. Nat. ser. iii, 7 (1847) 174.

Collected by Dr  ge (9429) at Port Natal, and referable to *Hymenochaete fuscoviolascens* (Mont.) Sacc., according to van der Byl (in Ann. Univ. Stellenbosch 7, 1929, 14). Saccardo (Syll. Fung. 6, 1888, 546) however, left the species under *Thelephora*, only suggesting in a footnote that it might be a *Hymenochaete*. The correct citation is thus *Hymenochaete fuscoviolascens* (Mont.) v. d. Byl as indicated by Doidge, loc. cit. p. 484. Dr  ge's specimen has not been available for personal study.

5. *Thelephora hirsuta* (Willd.) Pers. ex Fr.; Recorded for South Africa by Berkeley in Hooker Lond. Journ. Bot. 11 (1843) 516.
= *Stereum hirsutum* (Willd.) Pers. ex S. F. Gray; annotated in Bothalia 6 (1954) 316, f. 11.

6. *Thelephora intybacea* Pers. ex Fr.; Recorded by van der Byl in Trans. Roy. Soc. S. Afr. 10 (1922) 285 and in Ann. Univ. Stellenbosch 7 (1929) 32; Doidge in Bothalia 5 (1950) 495.

The writer has examined van der Byl's specimens determined as this species in Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nos. 214, 922, 1261, 1263. These are apparently indistinguishable from numerous South African collections named *Thelephora terrestris* in the National Herbarium, and from Herb. S.A. Mus. No. 34298, originally named *Thelephora laciniata* but annotated by v. d. Byl as *T. intybacea*.

The literature on *T. intybacea* does not clearly indicate how it differs from *T. terrestris* and moreover there is the complication that *T. intybacea* Pers. ex Fr. and *T. intybacea* Fr. are apparently not the same species. This confusion can obviously not be resolved outside Europe, but the probability is strong that *T. intybacea* does not occur in South Africa and that specimens recorded as such are actually the far commoner species *T. terrestris*. That opinion is adhered to here, and van der Byl's specimens are taken to be *T. terrestris*.

7. *Thelephora laciniata* Pers. ex Fr.; Recorded for South Africa by MacOwan in Cape Agric. Journ. 8 (1895) 331; Davidson in Natal Agric. Journ. 12 (1909) 617; Doidge loc. cit. p. 495.

Thelephora laciniata is generally acknowledged to be a synonym of *T. terrestris* Ehrh. ex Fr. Davidson's specimen does not exist, but I have seen MacOwan's (No. 1445, Herb. S.A. Mus. 34298) which is in no way different from *T. terrestris*.

8. *Thelephora palmata* (Scop.) Fr., Syst. Myc. 1 (1821) 432; Wood in Rept. Natal Bot. Gard. & Colonial Herbarium for 1898, p. 19; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 31; Doidge in Bothalia 5 (1950) 495.

This record is based on a single collection, in Herb. Kew., labelled "*J. M. Wood* (3497), *Thelephora palmata*, on ground in N.B. Gardens, Febr. 1885." The pilei are terrestrial, erect, flabelliform, and split longitudinally for about half their length into a number of flattened, narrow segments. The undivided base and the microscopic structure show that these segments are merely formed by splits in the fibrous pileus and are not clavarioid branches arising from a stem as is the case in *T. palmata*. Spores and basidia were absent, the only clear microscopic feature being the hyphae, which were pale coloured, lacking clamps, 2.5–3.2 μ diam., with thin or slightly thickened

walls. Both surfaces of the pilei were heavily covered with conidiophores and conidia of an *Aspergillus*. It is doubtful whether this collection is in good enough condition ever to be determined, but certainly it is not *Thelephora palmata*.

9. *Thelephora pedicellata* Schw.; Recorded by Wood in Rept. Natal Bot. Gard. & Colonial Herbarium for 1898, p. 19; Bottomley in S.A. Journ. Sci. 13 (1917) 440.

J. M. Wood recorded this fungus as "*Thelephora pedicellata* Schuz. (sic), on bark, No. 532." This collection was examined in Herb. Kew. and proved to be a species of *Septobasidium*, but could not definitely be referred to *S. schweinitzii* Burt (in Ann. Mo. Bot. Gard. 3, 1916, 324; Couch, The Genus *Septobasidium*, 1938, 112) with which *Thelephora pedicellata* Schw. is synonymous.

10. *Thelephora penicillata* Lloyd (non Fries) in Myc. Notes 6 (1920) 989, Figs. 1759, 1760; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 32, f. 12; Stevenson & Cash in Bull. Lloyd Library 35 (1936) 60; Doidge in Bothalia 5 (1950) 495.

FIG. 8.

Fructifications beginning as resupinate, fertile, membranous, whitish growths encrusting soil and debris, finely pubescent under the lens, smooth, following the conformation of the substratum, later becoming greyish then fuscous-purplish and finally drying fawn or chocolate brown. Flabellate fascicles of subulate radiating branches are emitted usually near the margin; they are oblique or suberect and become fertile with age at the base, white at first, then yellow-brown to fawn or chocolate brown with the apex remaining whitish and infertile. These branches are occasionally entire but are usually dissected into a number of penicillate or ciliate parts, and are up to 0.5–0.7 cm long. When growing on debris the fructification may become subpileate, but it is resupinate on soil. Microscopically the resupinate and pileate parts are the same.

Basidia: (30)–60 \times 8.5–11 μ , proliferating by basal clamps, with four sterigmata up to 7.2 \times 1.6 μ .

Spores: forming a chocolate coloured spore print, yellow-brown under the microscope, finely warted, irregularly angled, elliptic or subglobose, 4.8–7.2 \times 6.4–9.6 μ .

Hyphae: at first hyaline, some later becoming dark brown, branched, closely inter-twined, septate, with abundant clamps, 3.5–7 μ diam.

Specimens examined: 31417, J. D. Krige, Stellenbosch, June, 1919, (presumed Type collection); 31500, A. V. Duthie, Stellenbosch, July, 1923; 40512, P. H. B. Talbot, on soil and mosses, Fountains, Pretoria, 1951; 40712, P. H. B. Talbot, on soil and pine needles, Union Buildings Grounds, Pretoria, 1954.

This rather rare species inhabits very moist situations, especially favouring debris under pine trees but not confined to this habitat.

Lloyd (l.c.) named the earlier specimens from Stellenbosch *Thelephora penicillata*, about which Stevenson & Cash commented: "Seems to have been intended by Lloyd as a new species though his description and comparison with *T. spiculosa* Fr. might indicate that he had reference to *T. penicillata* Fr., Syst. Myc. 1, 434, 1821. In a note with a specimen of another species Lloyd refers to *T. penicillata* 'which I had named from South Africa.'"

Van der Byl and Doidge both attributed the specific epithet to Lloyd. If this is correct then it is a later homonym of *T. penicillata* Fr., and Lloyd's name has no nomenclatural standing. Lloyd regarded the South African specimens as differing from *T. spiculosa* Fr. in having the hymenium only on the resupinate portion and not on the erect subulate parts. However, further specimens show quite clearly that at least the basal parts of the penicillia become fertile with age.

From the literature alone there is very great difficulty in differentiating between *Thelephora mollissima* Pers. ex Fr., *T. spiculosa* and *T. penicillata*, for these names have been used in different senses by different authors. However, it seems fairly certain that our material is referable to the species described by Burt (Ann. Mo. Bot. Gard. 1, 1914, 225, Pl. 4, f. 2), after reference to an authentic specimen, as *T. spiculosa* Fr., and by Bourdot & Maire (in Bull. Soc. Myc. de Fr. 36, 1920, 29) as *T. spiculosa* Fr. forme *B. mollissima*. Used in this sense, *T. spiculosa* Fr. is regarded by several authors (Bourdot & Galzin, Hym. de Fr. 1928, 467; Bourdot & Maire, loc. cit.; Rea, Brit. Basid., 1922, 654; Lundell & Nannfeldt, Fung. Exsicc. Suecici No. 77, 1934) as synonymous with *Thelephora mollissima* Pers. ex Fr., and this is the name which I think should be adopted for *T. penicillata* Lloyd. Further work is necessary before this can be confirmed.

Dr. John Eriksson of Värnamo, Sweden, has kindly examined these specimens and has concluded that they are *Thelephora mollissima* Pers. ex Fr.

11. *Thelephora (Stereum) pulverulenta* Lév. (!) in Ann. Sci. Nat. ser. iii, 5 (1846) 149; Doidge in Bothalia 5 (1950) 491; Talbot in Bothalia 6 (1954) 323.

Corticium (Coniophora) pulverulentum (Lév.) Cooke in Grevillea 8 (1880) 89.

Coniophora pulverulenta (Lév.) Massee in Journ. Linn. Soc. Bot. 25 (1889) 129; Saccardo, Syll. Fung. 6 (1888) 649; Doidge in Bothalia 5 (1950) 480.

The type of this species, Drège 9442, as noted previously (Talbot, loc. cit.) is a *Hymenochaete*, probably *H. luteobadia* (Fr.) Höhnelt & Litsch.

12. *Thelephora punicea* Alb. & Schw.; Recorded for South Africa by Wood in Rept. Natal Bot. Gard. & Colonial Herbarium for 1898, p. 19; Kalchbrenner in Grevillea 10 (1881) 58.

J. M. Wood recorded this fungus as "*Thelephora punicea* Alb. & Schw., on bark, No. 190". Van der Byl (in Ann. Univ. Stellenbosch 7, 1929, 19) quotes Wood's record and gives a description, taken from Rea's "British Basidiomycetes", under *Hypochnus puniceus* (A. & S.) Sacc. Bourdot & Galzin (Hym. de Fr., 1928, 769) describe this species from Europe under the genus *Tomentella* as *T. punicea* (A. & S.) Schroet. Wood's collection is no longer in existence and so the record cannot be confirmed.

13. *Thelephora sinuans* Pers.; Recorded by Lévillé in Ann. Sci. Nat. ser. iii, 5 (1846) 146.

The record refers to a collection by Drège (944), Caput Bonae Spei, but no material is available from Herb. Mus. Paris and so the record has not been confirmed. Fide Lentz (U.S.D.A. Agric. Monogr. No. 24, 1955, 35) *T. sinuans* is a synonym of *Stereum frustulatum* (Pers. ex Fr.) Fuckel.

14. *Thelephora terrestris* Ehrh. ex Fr., Syst. Myc. 1 (1821) 431; Ehrhart, Crypt. Exsicc. No. 178 (1785); Doidge in Bothalia 5 (1950) 495.

Thelephora laciniata Pers. ex Fr., Syst. Myc. 1 (1821) 431; Persoon, Syn. Fung. (1801) 567.

FIG 9.

Fructifications effuso-reflexed and encrusting, more usually dimidiate and sessile, imbricate or confluent, occasionally shortly stipitate. Surface fawn to chocolate or

dark fuscous colour, usually strigose. Hymenium smooth to finely radiately rugose and papillate, concolorous. Texture coriaceous, soft, thin. Margin whitish then concolorous, entire to shortly laciniate and strigose-fibrous.

Basidia: not seen (fide Bourdot and Galzin: $40-90 \times 9-12 \mu$).

Spores: coloured, fuscous, finely and sparsely verrucose, subglobose to broad ellipsoid and irregularly angled, $(7)-9-11 \times 7-8 \mu$.

Hyphae: coloured brownish, thin-walled, some inflating and then collapsing, with occasional clamps, not encrusted, $3-5 \cdot 5-8-(11) \mu$ diam.

Specimens examined: As *T. terrestris*: Nos. 27560, 30616, 40206, 40670, 40657, 13020, 19852, 27329, 27330, 1067, 10049.

As *T. intybacea*: No. 25863; Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nos. 1263, 214, 1261, 922.

As *T. laciniata*: Nos. 11107, 34406, 30712; Herb. S.A. Mus. No. 34298 (*MacOwan* 1445), Table Mountain.

EXPLANATION OF THE ILLUSTRATIONS.

The following lettering has been used throughout the illustrations:—

B. = Basidia.	G = Gloecystidia.
C = Cystidia.	H = Hyphae.
CO = Conidia	HA = Habit.
CP = Conidiophores.	S = Basidiospores.
CY = Cystidioles.	SE = Setae.
D = Dendrophyses.	SH = Surface hairs.

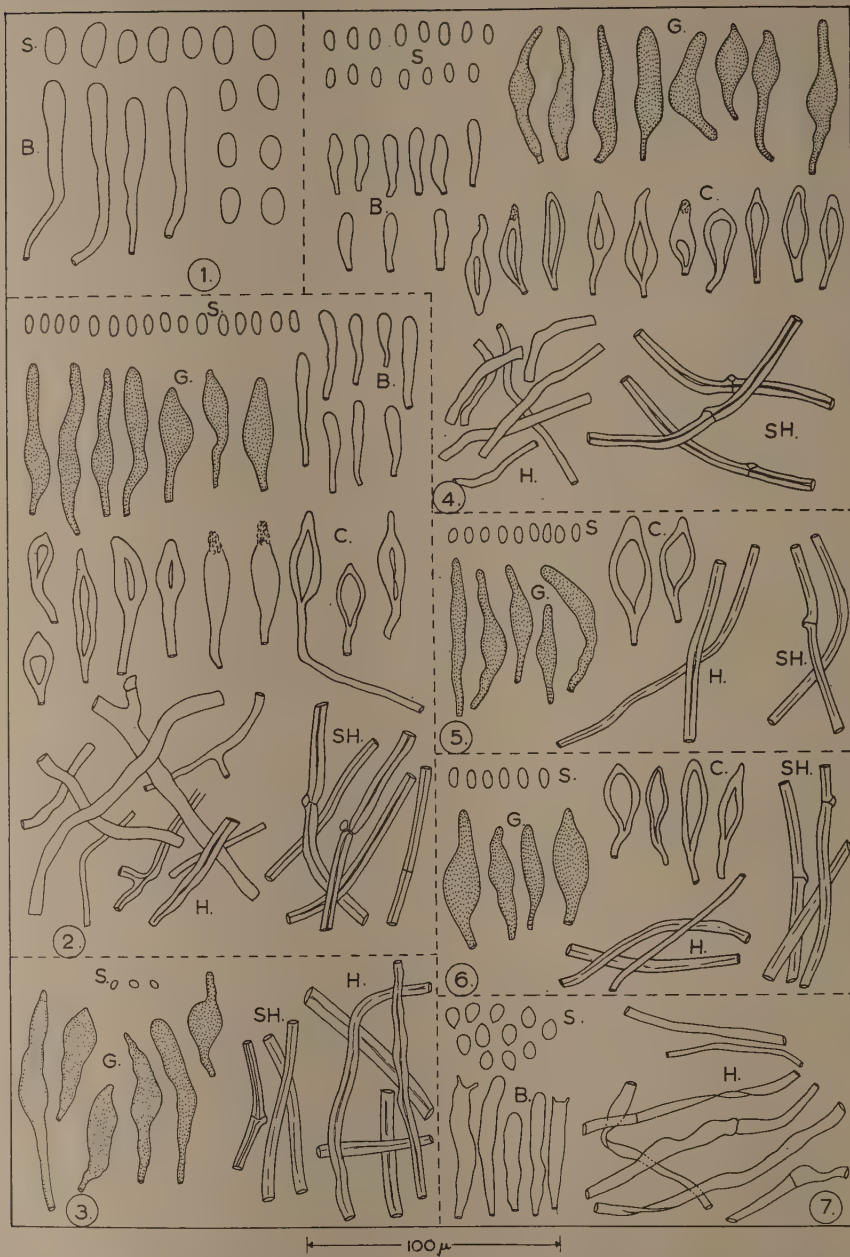


FIG. 1.—*Craterellus cornucopioides* (J. M. Wood No. 4108). FIG. 2.—*Cladoderma spongiosa*. FIG. 3.—*Cladoderma dendritica*. FIG. 4.—*Cladoderma australica* (J. M. Wood No. 239), neotype. FIG. 5.—*Cladoderma elegans*. FIG. 6.—*Cladoderma infundibuliformis*. FIG. 7.—*Cladoderma funalis* (Eyles No. 5026).

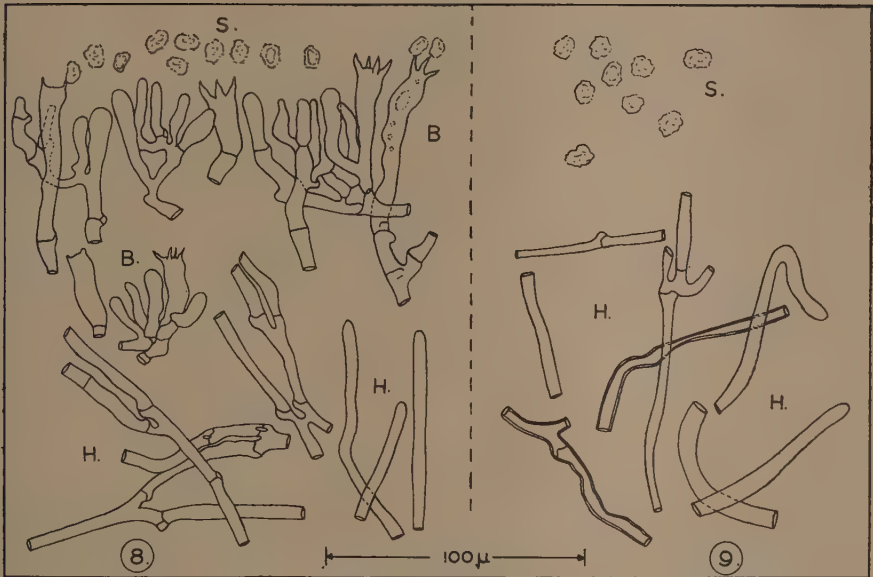


FIG. 8.—*Thelephora penicillata* Lloyd. FIG. 9.—*Thelephora terrestris*.

Studies of some South African Resupinate Hymenomycetes.

Part II.*

By

P. H. B. Talbot.

The following descriptions and notes are based on material seen since the first paper in this series was published. I am indebted to the Transvaal and Orange Free State Chamber of Mines Timber Research Laboratory for submitting several interesting collections and particularly for allowing Miss V. C. Green to collaborate in the preparation of descriptions and illustrations of three of the species discussed here. My sincere thanks are also due to the Directors of the following institutions for the loan of specimens: Herbarium, Royal Botanic Gardens, Kew; Herbarium, British Museum (Natural History); Museum National D'Histoire Naturelle, Paris; U.S. National Fungus Collections, Beltsville; Herbarium, S.A. Museum, Cape Town; Herbarium, Dept. of Agriculture, Southern Rhodesia; Herbarium Len Verwoerd, Stellenbosch-Elsenburg Agricultural College.†

PLATYGLOEA Schroet.

1. *Platygløea opalina* sp. nov.

FIG. 1.

Resupinate, effused, gelatinous, forming a thin opalescent pellicle, drying to an extremely thin, shiny, light grey, subpruinose film, occasionally cracked across. Thickness in section 130–146 μ .

Basidia: probasidia arising as lateral branches of hyphae, clavate-cylindrical almost from the beginning, elongating and changing into a cylindrical metabasidium divided by transverse septa into 3–4 metabasidial cells each with a sterigma. Metabasidia $6.4\text{--}9 \times 60\text{--}80 \mu$.

Spores: hyaline, smooth, elliptical with one side flattened, or cylindric-depressed, with a lateral apiculus and often with one or more conspicuous guttules, $(7.2)\text{--}8\text{--}9.6 \times (14.4)\text{--}16\text{--}18.4 \mu$, germinating to form secondary spores on a lateral germ tube.

Hyphae: $2.4\text{--}5.6 \mu$ wide, branched, with numerous septa, lacking clamp connections, thin-walled, erect, possessing large guttules in the wider hyphae, loosely intertexted.

Specimens examined: Type, 36951, Talbot, on *Acacia mollissima*, Atholl Expt. Stn., 1949.

This species does not correspond with any previously described species that I have been able to trace, including those in Bandoni's survey of the genus (in *Mycologia* 48, 1956, 821–840).

* Part I of these studies appeared in *Bothalia* 6 (1951) 1–116.

† *Vir die geleentheid om eksemplare in die Herbarium P. A. van der Byl te bestudeer en vergelyk is ek dank verskuldig aan die Universiteit van Stellenbosch.*

Platyglea opalina sp. nov.

Fungus resupinatus, effusus, gelatinosus, opalinus, tenuissimus, nitidus, pallido-griseus, 130–146 μ crassus, ut siccus subpruinose vel membranaceus. Probasidia ab initio cylindraco-clavata; metabasidia cylindraco, transverso-septata, cellulis 3–4, 6.4–9 \times 60–80 μ . Sporae hyalinae, leves, ellipticae, uno latere compressae, laterale apiculatae, (7.2)–8–9.6 \times (14.4)–16–18.4 μ . Hyphae 2.4–5.6 μ diam., ramosae, septatae, non nodoso-septatae, tenue tunicatae, erectae, laxae intertextae. Typus No. 36951, leg. P. H. B. Talbot, in ramis *Acaciae mollissimae*.

EICHLERIELLA Bresadola.

1. *Eichleriella macrospora* (Ell. & Everh.) Martin in Univ. Iowa Stud. Nat. Hist. 18 (1944) 48, Ibid. 29 (1952) 65, Figs. 14, 36.

Corticium macrosporum Ell. & Everh. in Bull. Torrey Bot. Club. 27 (1900) 49.

Sebacina macrospora (Ell. & Everh.) Burt in Ann. Mo. Bot. Gard. 2 (1915) 759.

FIG. 2.

Resupinate, composed at first of small, very thin, suborbicular, pruinose to byssoid growths of a light brown colour with white, cottony margin, becoming confluent to form a coriaceous-membranous patch, 6 \times 1 cm, with a narrow, determinate, white margin, adherent in the present specimen. Hymenium light brown, to greyish-white or pale dirty grey-brown, pruinose under the lens, beset with small, blunt tubercles which are fertile. Thickness in section 130–230 μ . Adnate, becoming cracked with deep fissures down to the substratum, revealing a white, cottony trama.

Basidia: tremelloid, the metabasidia clavate to elongated obovate, cruciately longitudinally divided, 9–11.5 \times 21–23 μ , sometimes showing a basal clamp connection. Sterigmata four, 3.5–4.5 \times 11.5–21 μ .

Spores: hyaline, smooth, oblong or broad-cylindric, sometimes very slightly depressed on one side, with a lateral apiculus, 0–1–2 guttulate, 5.7–(10) \times 11.4–14.8 μ .

Paraphyses: (1) surrounding the basidia and projecting beyond them, 2.3–4.5 \times 22–45 μ , flexuous, tortuous, hyaline; (2) more clavate and not tortuous, arising from a clamp at the base of a basidium branch.

Hyphae and Tissue Differentiation: Some hyphae appearing to be next to the substratum are colourless, much branched, 2.8–3.4 μ wide, (thin) to thick-walled; also present are plentiful brownish concretions which take phloxine stain readily and are apparently mixed with gelatinised hyphae in an intermediate layer.

Specimens examined: 39090, Talbot, On *Acacia* sp., Buffelspoort.

Except for the margin, which in this specimen is not free or reflexed, there is good agreement with Martin's description of *E. macrospora*. From McGuire's monograph of *Sebacina* (in Lloydia 4, 1941, 23) it appears that *Sebacina calcea* (Pers.) Bres. is close in characters to the present specimen, but may be distinguished by its longer spores, absence of tubercles, and paraphyses loaded with granules.

HETEROCHAETE Patouillard.

1. *Heterochaete byliana* sp. nov.

FIG. 5.

Resupinate, orbicular then widely effused, closely adnate, crustose-farinaceous. Hymenium whitish to pale straw-coloured or slightly greyed, somewhat pruinose, bearing scattered, sterile white (occasionally pale tinted) hyphal pegs which are not perfectly cylindrical and are sometimes forked, arising near the surface of the hymenium

and projecting 90–160 μ , measuring 32–48 μ wide, composed of practically hyaline hyphae 1.8–3.2 μ in diameter, somewhat dendroid, without appreciably thickened walls. Margin indeterminate, pruinose, concolorous, without a conspicuous bordering zone free from pegs. Thickness in section about 65 μ , excluding the pegs.

Basidia: probasidia pyriform to ovate, 12.8–19 \times 7.7–11 μ ; metabasidia cruciately longitudinally divided; sterigmata two, of variable length (up to 18 μ seen) and 3.2–3.7 μ wide.

Basidiospores: broad elliptic-depressed to suballantoid, hyaline, smooth, occasionally apiculate, 11.4–17.4 \times 5–8.3 μ .

Hyphae: hyaline, subgelatinous, difficult to distinguish except at the base where they are light brown with thin, rigid walls, 1.8–2.3 μ diam.; all hyphae lacking clamps.

Tissue differentiation: white, subgelatinous throughout except for the darker basal seam of more or less horizontal hyphae sometimes distinguishable.

Conidial stage: seen in part of a specimen, consisting of white, pruinose tufts with globose, hyaline conidia 2.3–3.6 μ diam.; conidial hyphae hyaline, thin-walled, 1.4–3.2 μ diam.

Chlamydospores terminal or intercalary, sometimes in short chains.

Specimens examined: Type, 41049, *Talbot*, Umtentweni, Natal, 1955; As *Heterochaete andina* Pat. & Lagerh.: Universiteit van Stellenbosch, Herbarium P. A. van der Byl No. 629, No. 698, on *Euphorbia pulcherrima*, No. 785, on *Plectronia*, all from Durban.

Van der Byl (in Ann. Univ. Stellenbosch, 1, 1923, 5), classed his specimens as *H. andina*, but thanks to Bodman's account of this species (in Mycologia 41, 1949, 529, f. 2) it is possible to differentiate it. *H. andina* has a pinkish tint to the fructification and possesses gloeocystidia and cystidia, but otherwise appears to be close to the new species *H. byliana*. The latter differs from *Heterochaete grandispora*, which was collected in the same locality, in its appreciably smaller spores and lack of gloeocystidia, and in being totally resupinate.

Heterochaete byliana sp. nov.

Fungus resupinatus, orbiculatus deinde late effusus, adnatus, crustaceo-farinaceus. Hymenium albidum vel pallido-stramineum vel griseum, pruinose, fasciculos hypharum ferens albidos, pallidos, 32–48 μ diam., 90–160 μ emergentes, ex hyphis hyalinis, dendroideis, 1.8–3.2 μ diam. formatos. Margo indeterminata, concolor. Probasidia pyriformia vel ovata, 12.8–19 \times 7.7–11 μ . Metabasidia sterigmatibus 2 usque ad 18 μ longa et 3.2–3.7 μ diam. Basidiosporae ellipticae vel suballantoideae, hyalinae, leves, 11.4–17.4 \times 5–8.3 μ . Hyphae hyalinae, subgelatinosae; hyphae basales pallido-brunneae, 1.8–2.3 μ diam., tenue tunicatae, non nodoso-septatae. Conidia hyalina, globosa, 2.3–3.6 μ diam. Chlamydosporae adsunt. Typus No. 41049, leg. P. H. B. *Talbot*.

2. *Heterochaete grandispora* sp. nov.

FIG. 4.

Resupinate or with reflexed margin, at first orbicular then confluent up to 1.5 cm diam., coriaceous. Hymenium white to pale straw colour, beset with abundant light brown, sterile, hyphal pegs originating in the trama and projecting 187–295 μ , 40–65 μ wide, composed of yellow-brown, parallel, interwoven hyphae 3.2 μ wide, with thickened walls. Margin concolorous, not adnate, determinate, often very slightly reflexed, free of hyphal pegs up to 1 mm from the edge. Context pale brown below a colourless hymenial layer. Thickness in section 280–380 μ .

Basidia: probasidia ovate-pyriform, becoming longitudinally cruciately divided, $18-20 \times 10-11.8 \mu$, embedded below the surface; metabasidia of the same dimensions; sterigmata of variable length, 2.7μ wide.

Spores: cylindric-curved to allantoid, smooth, hyaline, $(15)-23-30 \times (5.9)-7.3-9 \mu$, with a prominent truncate apiculus, germinating by repetition.

Gloeocystidia: in the hymenium, hyaline with a homogeneous content, not readily seen, $34-63 \times 4.5-8.2 \mu$.

Paraphyses: the hymenial hyphae rarely run out into rather simple hyaline dendrophyses, forked shortly once or twice, $1.4-2.7 \mu$ diam.

Hyphae: lightly coloured, densely intertexted, rarely branching or septate, thick-walled, $1.5-3.2 \mu$ diam., with undulating walls, lacking clamps. Hymenial hyphae similar but colourless.

Tissue differentiation: There is a colourless, subgelatinous hymenial layer above a light brown context.

Specimens examined: Type, 41050, *Talbot*, Umtentweni, Natal, 1955.

Martin [in Univ. Iowa Stud. Nat. Hist. 19 (1952) 62] estimates that about thirty species of *Heterochaete* have been described. Descriptions of most of these have been traced without finding any species approaching *H. grandispora* in spore size. Its margin, which is free of hyphal pegs and tends to be reflexed, and the widely spaced hyphal pegs, are characteristic.

Heterochaete grandispora sp. nov.

Fungus resupinatus vel margine reflexa, orbiculatus deinde confluens, coriaceus. Hymenium albidum vel pallido-stramineum, fasciculos hypharum ferens pallido-brunneos, $40-65 \mu$ diam., $187-295 \mu$ emergentes, ex hyphis parallelis, luteo-brunneis, 3.2μ diam., formatos. Margo concolor, determinata, sine fasciculis hypharum. Probasidia ovato-pyriformia; metabasidia $18-20 \times 10-11.8 \mu$, sterigmatibus 2.7μ diam. Sporae cylindraco-curvedae, leves, hyalinae, apiculo truncato, $(15)-23-30 \times (5.9)-7.3-9 \mu$. Gloeocystidia hyalina, $34-63 \times 4.5-8.2 \mu$. Paraphyses $1.4-2.7 \mu$ diam., hyalini, simplices, dendrophytici. Hyphae pallidae, dense intertextae, crasse tunicatae, $1.5-3.2 \mu$ diam., undulatae, non nodoso-septatae. Typus No. 41050, leg. *P. H. B. Talbot*.

PELLICULARIA Cooke sensu Rogers.

M. A. Donk (in Reinwardtia 2, 1954, pp. 425-434; *ibid.* 3, 1956, p. 369) argues with great justification that *Pellicularia koleroga* Cooke, the type species of the genus *Pellicularia*, is a *nomen confusum*, and that accordingly the generic name to be used for this group of species is *Botryobasidium* Donk. In the latter paper Donk also proposed two generic segregates, *Uthatobasidium* and *Thanatephorus*. Several "*Pellicularia*" species have already been combined under *Botryobasidium*, but there are still some for which a new combination would be necessary if the genus *Pellicularia* is to be dropped. It is to be regretted that Donk did not formally propose such combinations in his recent papers cited above. Without studying a much greater range of material than was available to me, I do not wish to propose the new combinations that might be necessary, and for the sake of uniformity have treated all these species under *Pellicularia*.

One new combination that Donk did make (in Reinwardtia 3, 1956, 376) may be noted: This is *Thanatephorus cucumeris* (Frank) Donk [= *Hypochnus cucumeris* Frank; *Hypochnus solani* Prill. & Delacr.; *Pellicularia filamentosa* (Pat.) Rogers].

1. *Pellicularia vaga* (B. & C.) Rogers ex Linder in Lloydia 5 (1942) 170; Rogers in Farlowia 1 (1943) 110, f. 9.

Corticium vagum Berk. & Curt. in Grevillea 1 (1873) 179. Further references and synonymy are given by Rogers (1943, l.c.).

FIG. 6.

Resupinate, thin, discontinuous, arachnoid later becoming hypochnoid, dirty whitish to pale tawny-yellowish.

Basidia: collapsing rather readily, $6.4 \times 17.6 \mu$, cylindrical or somewhat inflated at the base or apex [fide Rogers " $13-22-(27) \times 6.5-10-(15) \mu$, bearing rarely 4 or 5, mostly 6-8 stout, divergent recurved sterigmata $(3)-4.5-6 \times 1.5-2 \mu$ "].

Spores: hyaline, smooth, navicular or asymmetrically fusiform, obliquely tapered, $4.5-6 \times 9.6-12.8 \mu$ [fide Rogers " $7.5-12-(17) \times (2.5)-3.5-5-(5.5) \mu$ "]

Hyphae: loosely intertexted, smooth, lacking clamps, branching at right angles, with thin, rigid walls and a wide lumen, the basal hyphae slightly yellowish and up to 13μ wide with long internodes, the superior hyphae narrower, colourless, short-celled.

Specimens examined: 41048, Talbot, on dead wood in contact with the soil, Umtentweni, Natal, 1955.

Corticium vagum B. & C. has been recorded previously for South Africa by Doidge (in Bothalia 5, 1950, 483) who cites *Corticium solani* (Prill. & Delacr.) Bourd & Galz. as a synonym. These records require confirmation by reference to the cited specimens since the name *C. vagum* has been used in conflicting senses. Rogers (1943, loc. cit.) identifies the type material of *C. vagum* with *Pellicularia vaga* (B. & C.) Rogers ex Linder, and points out that *C. vagum* sensu Burt (in Ann. Mo. Bot. Gard. 13, 1926, 295) is synonymous with *Pellicularia filamentosa* (Pat.) Rogers, and that *Corticium solani* is another synonym of this parasitic species.

The collection described above was saprophytic and corresponds well with *Pellicularia vaga*, whose distinguishing features, according to Rogers are its saprophytic habit, its smooth navicular spores, its lack of clamp connections and cystidia, and its wide hyphae. *Pellicularia filamentosa*, on the other hand, is parasitic, and its spores are ellipsoid or oblong-ellipsoid, flattened on the inside, with an abruptly truncate apiculus.

2. *Pellicularia fodinarum* Talbot & Green, sp. nov.

FIG. 7.

Resupinate, thin, easily separable, pruinose-pellicular, with a similar margin. Hymenium yellowish, discontinuous, beset with long, emergent, hairlike septocystidia.

Basidia: in botryose clusters, very easily collapsing, cylindric-clavate, $4-6 \times 15-22 \mu$; adventitious groups of basidia arise as lateral offshoots of some of the septocystidia.

Spores: hyaline, smooth, subglobose to broad ovate-elliptical, $5-7.5 \times 4.5-6 \mu$.

Cystidia: very long, cylindrical, hyaline, septate, lacking clamps at the septa, with rounded apex, encrusted their full length with small wartlike granules (probably derived from a mucilaginous investment), up to 360μ long and $6-9 \mu$ wide.

Hyphae: loosely intertexted, collapsed in the hymenium otherwise distinct, much branched, anastomosed, septate, lacking clamps, thin-walled, encrusted with small wartlike granules, $4-6 \mu$ wide.

Minerals: abundant throughout the tissues.

Specimens examined: Type, 40679 (T.R.L. 2635), A. L. James, on underground timber, Brakpan No. 1 Shaft, Dec., 1950.

In its yellow colour, possession of septocystidia and spore characters this species is closely allied to *Pellicularia zealandica* G. H. Cunn. (in Trans. Roy. Soc. N.Z. 81, 1953, 322, Figs. 1, 2). *P. zealandica* does not, however, produce adventitious basidia from the septocystidia, possesses clamps in the hyphae and septocystidia, lacks encrusted hyphae and has the encrustation of the septocystidia confined to near the apex. Some rather similar fungi are placed by Bourdot & Galzin (Hym. de Fr., 1928) in the section Hyphales of the genus *Peniophora* but none of these corresponds exactly with this new species.

Pellicularia fodinarum Talbot & Green, sp. nov.

Fungus resupinatus, tenuis, non adnatus, pruinoso-pelliculatus. Hymenium luteolum, septocystidiis longis, emergentibus, ad pilos accedentibus. Basidia cylindraceo-clavata, $4-6 \times 15-22 \mu$; basidia adventitia lateralia ex quibusdam septocystidiis oriuntur. Sporae hyalinae, leves, subglobosae vel ovato-ellipticae, $5-7.5 \times 4.5-6 \mu$. Cystidia cylindracea, hyalina, septata, non nodoso-septata, apicibus rotundis, undique granis verrucosis incrustata, usque ad 360μ longa, $6-9 \mu$ diam. Hyphae laxae intertextae, ramosae, anastomosae, septatae, non nodoso-septatae, 6μ diam., granis verrucosis incrustatae. Typus No. 40679 (TRL 2635), leg. A. L. James, in ligno in aurifodinae.

3. *Pellicularia filamentosa* (Pat.) Rogers in Farlowia 1 (1943) 113, Fig. 11.

Hypochnus filamentosus Pat. in Bull. Soc. Myc. de Fr. 7 (1891) 163, Pl. 11, Fig. 2.

Corticium solani (Prill. & Delacr.) Bourd. & Galz. in Bull. Soc. Myc. de Fr. 27 (1911) 248.

Corticium vagum sensu Burt in Ann. Mo. Bot. Gard. 5 (1918) 128, Fig. 3, a, Ibid. 13 (1926) 295, Fig. 3, *pro parte* (nec. *C. vagum* Berk. & Curt.).

Corticium vagum var *solani* Burt ex Rolfs in Science n.s. 18 (1903) 729. For further synonymy see Rogers, loc. cit.

FIG. 8.

Fructifications resupinate, hypochnoid to pellicular, delicate, thin, drying white or buff-coloured.

Basidia: in botryose clusters, often discontinuous, subcylindrical to clavate or widest in the middle, $13-22 \times 9-11 \mu$, with four long sterigmata.

Spores: hyaline, smooth, ellipsoid, flattened on one side, with a truncate apiculus, $8-12 \times 5-7 \mu$.

Hyphae: hyaline, thin-walled, except at the base where they have slightly thickened walls and are pale coloured, lacking clamps, not encrusted, much branched at right angles, septate, $5-12 \mu$ wide (up to 17μ wide fide Rogers).

Specimens examined: Myc. Herb. Dept. Agric. S. Rhodesia, No. 5151, J. C. Hopkins, on *Solanum tuberosum*, Inyanga (as *Corticium solani*); 41434, Martin, on *Amarantus paniculatus*, Kempton Park.

Doidge (in Bothalia 5, 1950, 483) cites this specimen of Hopkins under *Corticium vagum* Berk. & Curt., but it is in excellent condition and a very good match with *P. filamentosa*. The former confusion existing between *Pellicularia vaga* (B. & C.) Rogers ex Linder and *P. filamentosa* (Pat.) Rogers is noted under the first of these species.

Two other specimens cited by Doidge viz. Myc. Herb. Dept. Agric. S. Rhodesia Nos. 4863 and 1783 as *Corticium vagum* were examined, but these have apparently deteriorated and no *Pellicularia* was found upon them. Another specimen, Pons, 29964, is sterile and indeterminable, though its wide hyphae and their arrangement suggest a species of *Pellicularia*.

4. *Pellicularia asperula* Rogers in Farlowia 1 (1943) 100, f. 2.

FIG. 37.

Fructification resupinate, delicate, pruinose to subpellicular, discontinuous, with conspicuous basal hyphae showing under the lens, drying near Pale Olive Buff or Smoke Gray (Ridgway).

Basidia: $9.5-17.2 \times 7-8 \mu$, subcylindric, with a more or less truncate, slightly expanded apex, with 6-(8) curved sterigmata up to 4.5μ long.

Spores: $4.5-5.2-5.6-(6) \times 3.0-4.0-(4.5) \mu$, ellipsoid, a little flattened on one side, apiculate, minutely asperulate, abundant, often coherent, hyaline to faintly coloured.

Hyphae: $4-15.5 \mu$ wide, without clamps, branched at right angles, the basal hyphae widest, long celled and with lightly coloured thickened walls up to 1.7μ thick; the superior hyphae hyaline, narrower, shorter celled, thin-walled and with cruciform cells.

Specimens examined: 41545, *P. H. B. Talbot*, on fallen twigs and litter of *Acacia mollissima*, Byrne, Natal, Apr., 1956. (Part also in New York Bot. Garden Herbarium).

This species was abundant when collected, forming a thin greyish covering to fallen twigs and humus, but only seen when the top layer of humus was disturbed. Microscopically the spores are very distinctive and differ from those of all other known species of *Pellicularia*. I am greatly indebted to Dr. D. P. Rogers for confirming my identification of this material and comparing it with the type collection. The species was previously known only from the type collection from Cuba.

CONIODICTYUM Har. & Pat. emend. G. Malençon.

1. *Coniodictyum chevalieri* Har. & Pat. in Bull. Soc. Myc. de Fr. 25 (1909) 13-14, Figs. a-c; Malençon in Bull. Soc. Myc. de Fr. 69 (1953) 77-100, Figs. 1-8 (as *Coniodictium*).

Hyalodema evansii P. Magnus in Ber. Deutsch Bot. Gesellsch. 28 (1910) 377-380, Pl. 11.

Coniodictyum evansii (P. Magn.) P. Magn. in Ber. Deutsch Bot. Gesellsch. 29 (1911) 1-2; Doidge in Bothalia 5 (1950) 685.

FIG. 3.

Mycelium parasitic in tissues of *Zizyphus*, filamentous, intercellular, hyphae $2-4 \mu$ diam., branched, septate, hyaline, with short coralloid, poorly differentiated haustoria, forming galls on the fruits, leaves, petioles and twigs. Hymenium subcortical, covered then erumpent, pulverulent, whitish-yellow, composed of homobasidia bearing basidiospores.

Basidia: clavate, $7-8 \times 23-36 \mu$, often deformed or atrophied, sometimes thick-walled especially near the apex, asterigmate.

Basidiospores: borne in a corona of (2)-4-8 sessile, ovoid, smooth spores at the apex of the basidium, hyaline, often deformed, coherent, becoming falsely septate through the development of a number of hyaline, spherical to compressed polygonal internal chlamydospores, the basidiospores finally coalescing into an irregular, hyaline, multicellular, dictyosporous ball, $15-20 \times 18-28 \mu$, which is detached as a whole from the basidium.

Specimens examined: All on *Zizyphus mucronata*: 92, *J. Burt Davy*, Zoutpansberg (presumed part of type of *H. evansii*); 1006, *Pole Evans*, Fountains; 30667, *L. Krause*, Johannesburg; 30223, *W. G. Rump*, Pietermaritzburg; 20611, *E. M. Doidge*, Hartbeestpoort; 15019, *J. M. Sim*, Pietermaritzburg; 11812, *T. Pallister*, Marikana;

11240, *J. M. Sim*, Buccleuch, Natal; 10095, *A. Jansen*, Dundee; 41019, *S. Truter*, Pietermaritzburg; 1214, *P. J. Pienaar*, Garstfontein; 2537, *H. L. Hall*, Nelspruit; 5648, *Pole Evans*, Cramond; 8789, *A. Pegler*, Kentani.

The genus *Coniodyctyum* was at first classed as a member of the Hyphomycetae (Mucedineae-Hyalodictyae), and only recently has Malençon (loc. cit.) shown in an excellent paper on the nature and affinities of *C. chevalieri* that this and three other puzzling genera are actually homobasidiomycetes and may best be accommodated in a new family, the Cryptobasidiaceae G. Malençon, coming near to the Exobasidiaceae. So far as is known *C. chevalieri* is purely African in distribution, and in South Africa it is recorded from parts of the Transvaal, Natal and Cape Provinces.

CONIOPHORA DC. ex Pers.

1. *Coniophora arida* (Fr.) Karsten, Finska Vet.-Soc. Bidrag Natur och Folk 37 (1882) 161; Saccardo Syll. Fung. 6 (1888) 648; Burt in Ann. Mo. Bot. Gard. 4 (1917) 244, f. 3; Bourdot & Galzin, Hym. de Fr. (1928) 359.

Thelephora (*Coniophora*) *arida* Fries, Elenchus Fung. 1 (1828) 197.

Corticium (*Coniophora*) *aridum* Fries, Hym. Eur. (1874) 659.

FIG. 9.

Resupinate, effused, adherent, floccose then pellicular or arid, or thinly submembranous, not readily separable. Hymenium smooth, not tubercular, pulverulent, bright sulphur yellow dulling to ochraceous or chamois then fawn olive to brown. Margin indeterminate, widely fibrillose to byssoid, eventually much reduced, whitish, composed of cordons of hyphae.

Basidia: subcylindrical to clavate, $25-50 \times 6-8 \mu$, with four sterigmata.

Spores: smooth, pale yellow to brown, ovate to ellipsoid, $10-13 \times 6-7 \mu$.

Hyphae: thin-walled, non-encrusted, septate, hyaline or pale coloured, $3-6 \mu$ wide, the basal and marginal hyphae often up to 12μ wide; ordinary clamp connections rare, whorled clamps present on some of the wide marginal hyphae, with branch hyphae often arising in whorls from these clamps.

Specimens examined: 41051, *Forest Res. Officer*, on *Pinus taeda*, Border Plantation, Natal; 39075 and 39076, *Talbot*, on *Acacia mollissima*, Atholl. Expt. Stn., E. Tvl.

Coniophora arida differs from *C. puteana* in the brighter colour of its fructification, which is also thinner, drier, less fleshy-membranous, and whose hymenium is not tuberculate and not easily separable from the substratum. The hyphae of *C. arida* tend to become pale coloured and are less compactly arranged than those of *C. puteana*. The characteristic whorled clamps which often give rise to whorls of branches on the wide marginal hyphae are not mentioned in descriptions available to me, but I have found them also on reliably determined exsiccata from England and Europe.

2. *Coniophora atrocinnerea* (Karst.) Karst.; Recorded by van der Byl in Ann. Univ. Stellenbosch 7 (1929) 17; Doidge in Bothalia 5 (1950) 480.

The record of this species is based on two specimens on *Pinus* in Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nos. 2451 and 2433. Both specimens have been examined and are referable to *Coniophora olivacea* [(Fries) ex Pers.] Karst., a species dealt with previously [in Bothalia 6 (1951) 35]. Rogers & Jackson (in Farlowia 1, 1943, 273) state that *C. atrocinnerea* is synonymous with *C. olivacea*, and they give a very full synonymy and useful taxonomic notes on the species.

3. *Coniophora betulae* (Schum.) Karst.; Recorded by Doidge in Bothalia 5 (1950) 480.

The specimen of this record is No. 30633, *K. Morgan*, which is here made the type of *Coniophora incrustata* Talbot, sp. nov.

4. *Coniophora cerebella* Pers.; South African records cited by Doidge in *Bothalia* 5 (1950) 481.

Doidge (loc. cit.) indicates this species as a synonym of *Coniophora puteana* (Schum. ex Fr.) Karst., which it is generally accepted to be. However, none of the South African specimens cited are the latter species. (see under *C. puteana*).

5. *Coniophora incrustata* sp. nov.

FIG. 10.

Resupinate, membranous, not adnate, readily detached from the substratum in large sheets. Margin not notably differentiated. Hymenium light brown to "Warm sepia" or "Bister" (Ridgway) from the accumulated spores. Thickness in section about 650 μ .

Basidia: not seen.

Spores: deep red-brown in a mass, yellow-brown in the microscope, smooth, ovate-elliptical, (5.6)–6–6.5–(8) \times (8.8)–9.6–11 μ , very copiously produced, some embedded in the tissues.

Hyphae: hyaline to pale straw-colour, the upper ones more or less indistinct, the basal ones distinct, very thin-walled and soon collapsing, 3–6–(8) μ wide when not collapsed, coated very heavily with mineral granules.

Specimens examined: Type, 30633, *K. Morgan*, on walls in dairy, Hopevale, Donnybrook, 1939.

This species has heavily encrusted, readily collapsing hyphae like those of *Coniophora betulae* (Schum.) Karst. or *C. suffocata* (Peck) Massee, but differs from these in several respects. It is appreciably thicker, more membranous, separable in large pieces, lacks a notably whitish margin, and above all has much darker spores which colour the hymenium a warm sepia or bister colour in contrast to the yellowish-olive-brown (tawny olive or umber) of the other two species. It is felt that these differences are sufficient to warrant the proposal of a new species. It is not entirely certain whether or not *C. betulae* and *C. suffocata* are distinct from one another, and in *Coniophora* as a whole there are few differential characters and numerous intermediates occur. *C. fumosa* Karst. has somewhat the same colour as *C. incrustata*, but rather smaller spores and non-encrusted hyphae, which are darker and distincter.

Coniophora incrustata sp. nov.

Fungus resupinatus, membranaceus, facile separabilis. Hymenium pallido-brunneum vel sepiaceum. Sporae in cumulo atro-badiae, in microscopo luteo-brunneae, leves, ovato-ellipticae, (5.6)–6–6.5–(8) \times (8.8)–9.6–11 μ . Hyphae hyalinae vel pallido-stramineae; hyphae basales distinctae, tenue tunicatae, mox collabentes, 3–6–(8) μ crassae, mineralibus forte incrustatae. Typus No. 30633, leg. *K. Morgan*, in muro.

6. *Coniophora pulverulenta* (Lév.) Massee in Journ. Linn. Soc. Bot. 25 (1889) 129; Saccardo Syll. Fung. 6 (1888) 649; Doidge in *Bothalia* 5 (1950) 480.

Thelephora (Stereum) pulverulenta Lév. (!) in Ann. Sci. Nat. ser. iii, 5 (1846) 149; Doidge in *Bothalia* 5 (1950) 491; Talbot in *Bothalia* 6 (1954) 323.

Corticium (Coniophora) pulverulentum (Lév.) Cooke in Grevillea 8 (1880) 89.

The type of this species, Drège 9442, has been examined and, as noted in *Bothalia* 6 (1954) 323, proved to be most probably *Hymenochaete luteobadia* (Fr.) Höhnelt & Litsch.

7. *Coniophora puteana* (Schum. ex Fr.) Karst.; Doidge in *Bothalia* 5 (1950) 481.

The records of this species in South Africa are summarised by Doidge (loc. cit.) All the specimens cited, except that collected by Laughton at Tokai, have been seen, and none of them is *C. puteana*. The three collected by Mrs. R. Brown in gold mines are all *Coniophora fodinarum* Talbot; No. 29723 on imported timber, is a species of *Coniophora* but not *C. puteana*; No. 30799 is a specimen of wood showing a cubical rot but the fungus is so scanty that it is indeterminable, and it bears basidiospores which are hyaline, $3.5-8.8\ \mu$, and are certainly not those of a *Coniophora*.

PUNCTULARIA Patouillard.

1. *Punctularia tuberculosa* (Pat.) Pat. (!) apud Patouillard & Lagerheim in Bull. Herb. Boiss. 3 (1895) 57, Pl. 2, Figs. 1, a-g; Patouillard, Essai Taxon sur les Hym. (1900) 57, f. 60; Saccardo Syll. Fung. 14 (1899) 223.

Corticium ? tuberculosum Pat. apud Patouillard & Lagerheim in Bull. Soc. Myc. de Fr. 8 (1892) 118; Saccardo Syll. Fung. 11 (1895) 126.

Punctularia atropurpurascens (B. & Br.) Petch in Ann. Roy. Bot. Gard. Perad. 6 (1916) 160.

Thelephora atropurpurascens B. & Br. in Journ. Linn. Soc. Bot. 14 (1875) 64; Saccardo Syll. Fung. 6 (1888) 546.

Punctularia affinis (B. & C.) Talbot in *Bothalia* 6 (1951) 25, Pl. 17.

Reticularia affinis B. & C. (!) in Journ. Linn. Soc. Bot. 10 (1869) 347; Saccardo Syll. Fung. 7 (1888) 418.

Reticularia venulosa B. & C. (!) in Journ. Linn. Soc. Bot. 10 (1869) 347; Saccardo Syll. Fung. 7 (1888) 419 (as *R. venosa*).

Reticularia atro-rufa B. & C. (!) in Journ. Linn. Soc. Bot. 10 (1869) 347; Saccardo Syll. Fung. 7 (1888) 419.

Ceriumyces venulosus (B. & C.) Torrend in Bull. Soc. Portug. Sci. Nat. 4 (1910) 9.

Trichosporium curtisii Massee in Journ. Mycol. 5 (1889) 185, t. 14, f. 3; Saccardo Syll. Fung. 10 (1892) 583.

Corticium conigenum Shear & Davidson (!) in Mycologia 36 (1944) 296, f. 1-2.

FIGS. 14-25.

Conidial Stage: loose, floccose, pulvinate or irregular tufts of hyphae, forming a growth several mm thick, powdery with innumerable conidia, later collapsing into a tangled mass of hyphae and conidia, coloured various shades of reddy-brown to purple-brown or vinaceous-brown (carob brown, burnt umber, cameo brown, vinaceous brown, seal brown, warm blackish brown—Ridgway) or sometimes partly violaceous to lavender blue or greyish blue (greyish violet-blue, dark plum-purple, bluish violet-black—Ridgway), the margin whitish when young.

Hyphae: often adhering in strands, $2-3\ \mu$ wide, lightly coloured, thin-walled, branched, with clamp connections and septa, often minutely sculptured or encrusted with small mineral granules.

Conidia: purplish-brown in a mass, globose, oval or ellipsoid with much variation in shape, $(3.6)-4-4.5-(6)\ \mu$ diam., or $3.6-4.5 \times (5)-5.5-6.8-(8)\ \mu$. In culture the conidiophores are much branched and modified above into an acropetal chain of

alternately swollen and clamped portions. The specialised terminal and intercalary swellings round off into amerosporous conidia which are set free by dissolution of the adjoining parts of the conidiophore, fragments of which may remain attached to one or both ends of the conidia. The liberated conidia are smooth or very minutely punctate at first, later becoming minutely verrucose, and finally strongly verrucose and shrunken in old cultures.

Basidial Stage: effused, resupinate, loosely adnate, rarely narrowly but distinctly reflexed, subgelatinous, drying waxy to horny and crustose. Margin inconspicuous or shortly byssoid, indefinite or definite. Hymenium developed on small, discoid to elongated pulvinae which are seated on a common foundation tissue and separated by sterile fissures containing amorphous mineral matter which occasionally forms a conspicuous pale buff-coloured fringe to the pulvinae. When moist the pulvinae are irregularly hemispherical, wider at the apex than the base, and coloured a medium to rich reddish-brown; when dry they are flattened, irregularly areolate, coloured deep purple-brown or blue-black to fuscous (deep slaty brown, aniline black, fuscous—Ridgway), with a minutely dark-punctate surface which is not conspicuously convoluted. Dark brown abhymenial hairs are present in both resupinate and reflexed parts of the fructification. Thickness in section averages 400–500 μ , excluding the abhymenial hairs.

Basidia: long, flexuous, cylindric-clavate, $27\text{--}51 \times 4\text{--}7 \mu$, with 4 sterigmata, often with basal clamps. The basidia are seldom mature when collected, but fresh specimens may be induced to spore after a few hours in a damp chamber.

Basidiospores: hyaline (? finally very dilutely coloured), smooth, ovoid to ellipsoid, often with one flattened side, $(2\cdot7)\text{--}3\cdot5\text{--}4\cdot(5) \times 5\cdot5\text{--}7\cdot3\text{--}(8) \mu$.

Dendrophyses: in hymenium, composed of a hyaline, thick-walled stem bearing a dark brown, irregularly swollen, shortly branched apex. Apical part up to $5\cdot4 \mu$ wide and 29μ long; stem $2\cdot3\text{--}4\cdot1 \mu$ diam.

Context hyphae: subgelatinous, hyaline, smooth, mostly rather indistinct, about 2μ wide, with clamp connections.

Abhymenial hyphae: dark brown, fibrillose, densely interwoven, branched, smooth, thick-walled, with clamps, $(2)\text{--}2\cdot5\text{--}4\cdot5 \mu$ wide, some penetrating the substratum.

Tissue differentiation: the abhymenial hairs arise from a dark basal seam. The middle layer is hyaline, subgelatinous, containing scattered mineral concretions and somewhat indistinct hyaline hyphae. The hymenium is subgelatinous, containing abundant lightly coloured mineral granules and dark dendrophyses giving it a general light brown colour.

Specimens examined: As *P. tuberculosa* ex Herb. Mus. Paris—Type, leg. de Lagerheim, Puente de Chimbo, Ecuador, Aug., 1871; *C. Torrend*, Mycotheca Lusitanica, on *Olea europea*, Lumiar, 1–08; *Rick*, Fungi Austro-Americani 54, Sao Leopoldo, Brazil; As *Corticium conigenum*—Type, Shear (1405), on *Quercus* sp., Weikiwa Spa, Florida, ex U.S. National Fungus Coll.; Also specimens listed in Bothalia 6 (1951) 26, and No. 40150, Talbot, Pretoria.

In a previous publication (Talbot, loc. cit.) I regrettably overlooked the Rule (Art. 69, Stockholm Code) that the first valid name or epithet applied to the perfect state must take precedence as the name for the fungus, and incorrectly combined the earliest epithet for the conidial state under *Punctularia*.

Corticium conigenum Shear & Davidson, was suspected to be a *Punctularia* from the authors' description and illustrations. Comparison of its type with that of *P. tuberculosa* has not revealed any specific differences. In interesting cultural studies

Shear & Davidson found that single basidiospore cultures produced no clamps and consisted of two sex strains, which when grown together would produce clamps along the line where the two opposite strains met in culture. Clamps were not produced by combinations of cultures within the same sex strains. Basidiospore cultures gave rise to the conidial stage.

The method by which the conidia are formed in *P. tuberculosa* is particularly interesting, and approximates to that shown by the mould fungi grouped in Section 1 B of Hughes' classification of the types of conidiophore and conidium development (Hughes in *Canad. Journ. Bot.* 31, 1953, 577-659), except that here it is modified by the clamp connections.

In his description and illustrations of *P. tuberculosa*, Patouillard exaggerated the discreteness of the hymenial pulvinae. In rather small areas of the type they are discrete and surrounded by the pale coloured amorphous mineral matter, but mostly they are so close together, and separated by such narrow fissures, that the mineral fringe is not really conspicuous, and the whole appears more or less areolate and flattened, especially when dry. The dendrophyses occur in the hymenium, and not as a fringe to the pulvinae as stated by Patouillard. The pulvinae are seldom perfectly discoid, but are usually elongated and irregular in shape. My impression is that they dry more or less flat, and not into the depressed, saucer-like bodies illustrated by Patouillard.

There are most impressive and detailed similarities between *Punctularia tuberculosa* and *Phlebia strigoso-zonata* (Schw.) Lloyd, which has recently been excellently redescribed and made the type species of a monotypic genus, *Phaeophlebia* W. B. Cooke (Cooke in *Mycologia* 48, 1956, 401).

Punctularia tuberculosa and *Phaeophlebia strigoso-zonata* agree in the purple-brown to blue-black colour of the hymenium when dry, and its red-brown colour when moist. They have essentially the same kind of hymenium. It tends to be pulvinate in *Punctularia* and smooth to veined in *Phaeophlebia*, but the pulvinae of the former are often elongated and parts of the latter are often almost pulvinate. Both have a hymenium which, when dry, appears minutely punctate under a lens and is full of a cementing substance composed of lightly coloured granules forming a darkish zone around and above the hymenial elements. In each, the hymenial convolutions are separated by narrow deep fissures which are sterile and contain amorphous mineral granules, sometimes forming a fringe to the papillae. Each has a subgelatinous texture, drying horny to waxy. The basidia in each are rarely found in a mature condition and are long, narrow and flexuous, with basal clamps. Sections of these two species are extraordinarily alike and no significant difference in the arrangement of the tissues can be detected, though in *Phaeophlebia* the context hyphae are perhaps a little more distinct. In both, the hymenium contains dark dendrophyses. *Phaeophlebia* is usually resupinate-reflexed or pileate; *Punctularia* is usually resupinate, but (as shown in local specimens matched with the type and bearing also the conidial stage) can become reflexed as much as 1 cm from the substratum. In each species there are hyaline, clamped hyphae forming the middle layer and there is a dark basal seam and a trichoderm of dark, thick-walled, clamped hyphae. I regard this trichoderm as an indicator of potential reflexion even in species or specimens which are normally resupinate. The margin of *Phaeophlebia* is definite; that of *Punctularia* is usually indefinite, but not always so.

Punctularia tuberculosa has a known conidial stage and lacks gloeocystidia; *Phaeophlebia* has no known conidial stage and possesses gloeocystidia. These features are not, in my opinion, sufficient to hold the two genera apart, while in all other respects I regard them as congeneric. Accordingly I propose to sink the genus *Phaeophlebia* W. B. Cooke under *Punctularia* Pat. and to make the combination:

***Punctularia strigoso-zonata* (Schw.) Talbot comb. nov.**

= *Merulius strigoso-zonata* Schw. in Trans. Amer. Phil. Soc. n.s. 4 (1834) 160.

Phlebia strigoso-zonata (Schw.) Lloyd in Lloyd Myc. Writ. 4 (1914) L. 53, p. 15;
Talbot in Bothalia 6 (1951) 28.

Phaeophlebia strigoso-zonata (Schw.) W. B. Cooke in Mycologia 48 (1956) 401.

For a description of this species see W. B. Cooke (loc. cit.).

The systematic position of the genus *Punctularia* is still doubtful. *P. tuberculosa* has been placed by various authors in *Corticium* and *Thelephora*, and has been likened to *Grandinia*, *Aleurodiscus* or *Porothelium*. *P. strigoso-zonata* has previously been classified as a *Phlebia*, *Stereum*, *Auricularia* or *Phaeophlebia*. Most of these can be eliminated as not being near relatives. The nature of the hymenium, basidia, sterile structures and perhaps the spores, set *Punctularia* apart from other genera. Its holobasidia remove it from the Heterobasidiomycetes. Its structure is certainly not hydneaceous, nor cyphelloid. It has some brown hyphae, but does not accord with the hymenochaetoid or xanthochroic fungi. The distribution of the tissues in *Punctularia* is decidedly *Stereum*-like, though the texture and hymenium are different. Martin (in Proc. Iowa Acad. Sci. 50, 1943, 167) remarked that *Phlebia strigoso-zonata* had little in common with the Hydneaceae but a closer resemblance to the more fleshy species of *Merulius*. There might be a good case for the proposal of a new family to accommodate *Punctularia*, but this seems premature until the majority of the species and genera of the Thelephoraceae are known in greater detail. I would therefore place *Punctularia* provisionally in the subfamily Meruloideae of the Thelephoraceae, realising however that both the family and subfamily as now constituted are heterogeneous and artificial.

I wish to acknowledge the courteous and stimulating assistance given to me by Professor G. W. Martin and Dr. W. B. Cooke in correspondence about the genus *Punctularia*. This helped greatly in the formation of my ideas on this subject, for which, however, I accept full responsibility.

CORTICIUM Pers. ex Fries.

1. *Corticium abeuns* Burt in Ann. Mo. Bot. Gard. 13 (1926) 250; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 29, f. 10.

This record for South Africa rests on the specimen in Universiteit van Stellenbosch, Herbarium P. A. van der Byl, No. 1495. It was cited by Burt as a paratype of *C. abeuns*. Rogers & Jackson (in Farlowia 1, 1943, 280) have examined all Burt's paratypes of this species and concluded that the description was misleading and the paratypes confused. They identified some of the paratypes but, being mainly concerned with North American species, did not mention van der Byl's collection. This collection has been examined and is here referred to *Corticium porosum* Berk. & Curt.

2. *Corticium bombycinum* (Sommerf.) Bres.; Recorded by Doidge in Bothalia 5 (1950) 481.

One specimen is cited in support of this record, namely No. 33185, *Doidge & Bottomley*, Wolhuterskop, Boschfontein. This specimen is undoubtedly *Peniophora arenata* Talbot, and *C. bombycinum* should be omitted from South African records.

3. *Corticium lacteum* Fr.; Recorded by Saccardo, Syll. Fung. 6 (1888) 610; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 30; Doidge in Bothalia 5 (1950) 482.

No South African specimens under this name have been located and the record is based on Saccardo's mention of "Capite Bonae Spei" as one of the localities for this fungus, without giving any other details.

Rogers & Jackson (Farlowia 1, 1943, 294) give a long discussion on the status of the name *C. lacteum* Fr. and reject it as a *nomen dubium*.

4. *Corticium laetum* (Karst.) Pers.; Recorded by Lloyd. Myc. Writ. 6 (1920) 952; Doidge in Bothalia 5 (1950) 482.

Presumably the specimen sent by van der Byl to Lloyd, which is the basis of this record, is one of those in the National Herbarium, since there are none in the van der Byl Herbarium. All the specimens assigned to this species in Doidge (loc. cit.) have been examined and are referable to *Corticium salmonicolor* B. & Br., except No. 9154 which is *Helicobasidium compactum* (Boedijn) Boedijn. The material of No. 27267 is poor but may be the *Necator decretus* state of *C. salmonicolor*. This conidial stage has recently been found on *Pyrus malus* in Natal (No. 41053).

5. *Corticium moniliforme* sp. nov.

FIG. 11.

Resupinate, effused over soft, dead wood, adnate, deeply and abundantly cracked down to the substratum when dry, the cracks not usually connected by subicular strands. Hymenium smooth, white, chamois or biscuit colour when dry, with a paler white, indefinite, pruinose or pellicular margin. Texture membranous-waxy. Context somewhat stratified, concolorous, 400–450 μ thick in section.

Basidia: clavate, often with a basal clamp connection, (27)–32–40 \times 6.5–8.5 μ , with four sterigmata.

Spores: cylindrical to elliptical, hyaline, smooth, non-amyloid, with rounded ends, 7.4–10 \times 3–4.8 μ .

Gloeocystidia: arising in the middle layers or below and extending into the hymenium but not emerging, originating from a system of tortuous hyphae, thin-walled, with homogeneous contents, with a cylindric-clavate basal part or cell and the superior part divided by as many as 12 constrictions into a moniliform structure with constrictions often so deep that a chain of superimposed cells is formed, with a scarcely perceptible isthmus between each. The globose cells get progressively smaller towards the apex of the gloeocystidium. Gloeocystidia 85–100 μ long and 5.7–9.6 μ wide, sometimes with a basal clamp connection.

Hyphae: (1) the system from which the gloeocystidia arise has hyaline, thin-walled hyphae, very much branched and anastomosing in a wide network, tortuous, with nodular swellings and irregular outline, septate, easily stained with phloxine, 2.8–4.3 μ wide, found throughout the context; (2) a ground tissue of hyaline, septate, thin-walled, branched hyphae, with occasional clamp connections, which do not stain and are always indistinct as they collapse easily.

Minerals: present throughout the tissues.

Specimens examined: Type, 36899, Talbot, Hennops River; 36936, Talbot, Hennops River.

The moniliform gloeocystidia suggest an *Aleurodiscus* but the relatively small basidia and small non-amyloid spores and lack of other paraphysoid structures, distinguish the present species from *Aleurodiscus*. In the genus *Corticium* I have found only two species described with moniliform gloeocystidia: *Corticium radiosum* Fr., according to Cunningham (Trans. Roy. Soc. N.Z. 82, 1954, 290) has moniliform gloeocystidia, but its spores are oval or subglobose, 8–11 \times 7–8 μ . *Corticium septentrionale* Burt, which is a synonym of *Corticium litschaueri* Burt (fide Rogers & Jackson in Farlowia 1, 1943, 300), also has gloeocystidia of the same type, but according to Cunningham (loc. cit. p. 293) these may project sometimes up to 14 μ and its spores are smaller, 6–8 \times 2.5–3 μ . It appears to differ from the new species in hyphal characters, the hyphae being much more regular, not tortuous nor collapsing.

Corticium moniliforme Talbot sp. nov.

Fungus resupinatus, effusus, adnatus, membranaceo-ceraceus, ut siccus profunde fissus. Hymenium leve, albidum, bubalinum vel isabellinum. Margo indefinitus, pruinosis vel pelliculosus, albidus. Basidia clavata, $(27) - 32 - 40 \times 6.5 - 8.5 \mu$, saepe ad basem nodoso-septata, sterigmatibus 4. Sporae cylindraceae vel ellipticae, hyalinae, leves, non amyloideae, $7.4 - 10 \times 3.4 - 4.8 \mu$. Gloeocystidia cellulis basalibus cylindraceo-clavatis, partibus superioribus moniliformibus, interdum ad basem nodoso-septata, non emergentia. Hyphae (1) hyalinae, tenue tunicatae, tortuosae, anastomosae, septatae, tumoribus nodulosis inaequalibus (2) hyalinae, tenue tunicatae, ramosae, nodoso-septatae, obscurae. Typus No. 36899, leg. P. H. B. Talbot.

6. *Corticium pelliculare* Karst.; Recorded by van der Byl in Ann. Univ. Stellenbosch 7 (1929) 29; Doidge in Bothalia 5 (1950) 482.

The only specimen on which this record is based is Universiteit van Stellenbosch, Herbarium P. A. van der Byl No. 2225, Knysna. This specimen is certainly not *C. pelliculare*, but instead is readily identifiable with *Peniophora arenata* Talbot (in Bothalia 4, 1948, f. 4 and Ibid. 6, 1951, 22). *Corticium pelliculare* should be eliminated from South African records.

7. *Corticium porosum* Berk. & Curt. apud Berk. & Br. in Ann. Mag. Nat. Hist. ser. v, 3 (1879) 211; Rogers & Jackson in Farlowia 1 (1943) 300; Cunningham in Trans. Roy. Soc. N.Z. 82 (1954) 295, f. 13. Further synonyms and literature references given by Rogers & Jackson, loc. cit.

FIG. 13.

Resupinate, effused, thin, membranous, separable in small pieces when moist, white to ivory yellow, drying chamois. Hymenium cracked occasionally and smooth, or faintly tuberculate. Margin whitish, thinning out. About 220–250 μ thick in section. Basidia: clavate, $15 \times 4 \mu$.

Spores: ellipsoid to subglobose, $3 \times 4 \mu$ ($4 - 6 - 7 \times 3 - 4 \mu$, fide Bourdot & Galzin), hyaline, amyloid, appearing smooth under low magnification but actually minutely roughened under oil immersion.

Gloeocystidia: mostly originating in the basal layer but some small ones are hymenial, thin-walled, sometimes the wall slightly thickened at the base, subulate to ventricose or fusiform, usually becoming narrow towards the apex, flexuous, possessing granular yellowish contents, not becoming brown in Iodine solutions, abundant, 8–13 μ wide at the base and tapering to 3–6 μ wide higher up, 40–186 μ in length.

Hyphae: 2–3 μ diam, branched, interwoven in a more or less vertical direction, not encrusted.

Specimens examined: As *Corticium abeuns* Burt: Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nr. 1495, Houtbos, Tvl.

Although determined as *Corticium abeuns* by Burt, this specimen is not that species. Rogers & Jackson (loc. cit.) found that three other paratypes of *C. abeuns* were actually *Corticium porosum*. The present collection has the general structure of the *C. porosum* group and corresponds with this also in having amyloid, minutely roughened spores, and gloeocystidia which do not turn brown with Iodine. Its spores are small, being at the minimum range of size for this species. The gloeocystidia of typical examples of *C. porosum* are frequently, but not invariably, bifurcate at the base, while their apex is possibly a little less flexuous than those in the present specimen. Nevertheless the species is known to very variable in the nature of its gloeocystidia. Cunningham (loc. cit.) notes that "Practically every section examined shows a somewhat different microstructure, consequently it is advisable to regard these as forms of this variable species, as Rogers & Jackson have done. In general, thick specimens have longer gloeocystidia and more of them in the lower portions of the context".

It seems likely that this species will find general acceptance as *Gloeocystidiellum porosum* (B. & C.) Donk (see Donk in *Fungus* 26, 1956, 9).

8. *Corticium punctulatum* Cooke in *Grevillea* 6 (1878) 132; Further references and synonymy, see Rogers & Jackson in *Farlowia* 1 (1943) 320.

Hypochnus eylesii van der Byl (!) in *S.A. Journ. Sci.* 22 (1925) 168, in *Ann. Univ. Stellenbosch* 7 (1929) 18.

FIG. 12.

Resupinate, widely effused, hypochnoid to submembranous, not cracked, adherent, light yellowish to creamy. Hymenium pruinose, pubescent from the projecting gloeocystidia. Margin entire or pruinose. Thickness in section about 230 μ .

Basidia: clavate to cylindrical, 5-6-6.5 μ wide.

Spores: Hyaline, finely asperulate, subglobose to broad elliptic, 4.8 \times 5.6 μ or 4.8-6.4-8 μ diam., often uniguttulate, thin to thick-walled, very abundant, free or embedded in the context.

Gloeocystidia: embedded in all parts of the trama, some also projecting 22-64 μ above the hymenium where they are cystidioid and usually lightly encrusted with large mineral particles; the embedded gloeocystidia are smooth, thin-walled, with hyaline, homogeneous contents, ventricose to subulate or cylindrical, with a blunt, rounded apex, 13-(19) μ wide at the base, 70-115 μ long.

Hyphae: basal hyphae clearly seen, hyaline, with frequent clamps, septate, smooth, branched, with thickened walls, 4-6.4 μ wide. Hyphae of middle layer compacted and indistinct, but apparently like the basal ones only with thinner walls.

Specimens examined: 40684 (T.R.L. 2937), *M. Mrost et al.*, on underground timbers, Venterspost Mines; 40678 (T.R.L. 2617), *A. L. James et al.*, on underground timbers, Venterspost Mines; 40682, (T.R.L. 2758) *A. L. James*, on pitch pine sills, Blyvooruitzicht Mine; As *Hypochnus eylesii* (Isotype) in Herbarium Len Verwoerd (30), Stellenbosch-Elsenburg Agric. Coll., leg *F. Eyles*, Stellenbosch, May, 1923.

These collections come clearly in the group of species which includes *Corticium albostramineum*, *Peniophora sphaerospora*, *Gloeocystidium cremicolor* and *G. eichleri*. These four are regarded by Bourdot & Galzin (Hym. de Fr., 1928, 262) as forms of *Gloeocystidium albostramineum*, and by Rogers & Jackson (*Farlowia* 1, 1943, 320) as synonyms of *Corticium punctulatum* Cooke, which we accept here as the name for this complex. Bourdot and Galzin distinguish these forms on differences in spore size, compactness of the tissues, and so on, but evidently Rogers and Jackson regard these as minor variations about a central species.

The isotype of *Hypochnus eylesii* van der Byl, apparently the only material of this species in existence, is an excellent match with *C. punctulatum*. Its tissues are more laxly intertexted than those of the specimens from Transvaal mines, while more of its spores have the walls thickened. The Transvaal material corresponds most closely with the description of *C. cremicolor* in spore size and in the compact trama, but undoubtedly the watersoaked habitat has had an effect on the appearance of this material.

9. *Corticium solani* (Prill. & Delacr.) Bourd. & Galz.; Records cited by Doidge in *Bothalia* 5 (1950) 483.

= *Pellicularia filamentosa* (Pat.) Rogers, q.v.

10. *Corticium vagum* Berk. & Curt.; Records cited by Doidge in *Bothalia* 5 (1950) 483.

= *Pellicularia vaga* (B. & C.) Rogers ex Linder, q.v.

11. *Corticium vagum* var *solani* Burt ex Rolfs; Records cited by Doidge in *Bothalia* 5 (1950) 483.

= *Pellicularia filamentosa* (Pat.) Rogers, q.v.

PENIOPHORA Cooke.

1. *Peniophora carnososa* Burt in Ann. Mo. Bot. Gard. 12 (1925) 325; Doidge in Bothalia 5 (1950) 486.

The specimen on which this record is based is No. 27761 (*Rump*, 107). This is definitely not *P. carnososa*, which has hairlike, non-encrusted cystidia, a bright yellow hymenium and context, and occurs on coniferous wood. Instead this specimen has large, conical, encrusted cystidia and occurs on frondose wood. Though poor in condition and lacking spores it may be identified by its general structure and cystidia as *Peniophora roumeguerii* Bres., which was noted in Bothalia 6 (1951) 22, pl. 14.

2. *Peniophora cinerea* (Pers. ex Fr.) Cooke in Grevillea 8 (1880) 20, pl. 123, f. 8.; Saccardo Syll. Fung. 6 (1888) 643; Burt in Ann. Mo. Bot. Gard. 12 (1925) 353; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 16; Doidge in Bothalia 5 (1950) 486.

Corticium cinereum Pers. ex Fries, Epicr. Syst. Myc. (1838) 563.

Doidge cites three collections in support of this record. I have examined Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nr. 326. on *Pyrus malus*, determined by Burt, loc. cit. This is a resupinate, grey member of the Coloratae group of *Peniophora*, and is probably referable to *P. cinerea*. But as it is very young, consisting only of primordia just emerging from the lenticels, I would wish to see further specimens before being certain that this species is represented here. In this specimen the margin is free but not reflexed, and the spores are $11-11.5 \times 4-5 \mu$.

No. 22044 (Fungi MacOwaniani No. 1054, Boschberg, Somerset East, as *Corticium cinereum* Fries) is a typical specimen of *Stereum umbrinum* B. & C. The copy of MacOwan 1054 in Herb. S.A. Museum No. 34248 resembles the Pretoria copy superficially but is a true species of *Hymenochaete*. It is however fragmentary and indeterminate.

3. *Peniophora cremea* Bresadola, Fungi Trid. 2 (1898) 63; Recorded for South Africa by Burt in Ann. Mo. Bot. Gard. 12 (1925) 263; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 16, f. 3; Doidge in Bothalia 5 (1950) 486.

All the specimens noted by Doidge in support of this record have been examined, and none is considered to represent *P. cremea*. The record rested originally on Burt's determination of *van der Byl* No. 612, but he was evidently in some doubt about it since this collection is annotated by van der Byl (translated), "Species unknown by Burt. In all probability *P. cremea*." The three specimens in Universiteit van Stellenbosch, Herbarium P. A. van der Byl, Nos. 612, 1468, 1488 are *Peniophora pelliculosa* Talbot, No. 1468 being the most typical. Nos. 30231 and 34359 in the National Herbarium are also *P. pelliculosa*, while No. 28288 is the type of *Corticium gloeosporum* Talbot. On present knowledge *P. cremea* is not acceptable as a South African species,

4. *Peniophora gracillima* Ell. & Everh. ex Rogers & Jackson in Farlowia 1 (1943) 317.

Peniophora glebulosa sensu Bresadola, Fung. Trid. 2 (1898) 61, Pl. 170, f. 2; Saccardo Syll. Fung. 16 (1902) 195; Rea, Brit. Basid. (1922) 688; Bourdot & Galzin, Hym. de Fr. (1928) 288; Burt in Ann. Mo. Bot. Gard. 12 (1925) 282; van der Byl in Univ. Stellenbosch 7 (1929) 15; van der Byl in S.A. Journ. Sci. 23 (1926) 288; Doidge in Bothalia 5 (1950) 486.

FIG. 28.

Resupinate, effused, membranous, rather adherent, whitish to cream or yellowish, pubescent on account of the projecting cystidia, becoming cracked into small clods when dry. Margin thinner, similar or pruinose. Up to 200μ thick in section.

Basidia: small, clavate, about $10 \times 3.5 \mu$.

Spores: hyaline, allantoid or cylindric-curved, smooth, $1.5 \times 6.4-7.2 \mu$. [(5)–9–10 \times 1.5–3 μ fide Bourd. & Galz.; 6–9 \times 1.5–2 μ fide Burt].

Cystidia: abundant, arising deep in the trama and transversing it, embedded or projecting 40–64 μ beyond the hymenium (up to 110 μ in European material); tubuliferous, cylindrical, hyaline, 60–120 μ long or longer, 7–12 μ wide, very thick-walled with a canalicular lumen which is dilated brusquely at the apex so that the apex is thin-walled. Apex rounded, smooth or often covered with granular mineral matter. Walls of the cystidia soluble in KOH, but not in lactic acid, leaving only the lumen visible. Cystidia borne laterally on basal hyphae, sometimes bifurcate at the base.

Hyphae: indistinct. The basal cystidiophores in European material are 3–5 μ wide, thick-walled, and the tramal hyphae are indistinct, 2–3 μ wide, thin-walled.

Specimens seen: Universiteit van Stellenbosch, Herbarium P. A. van der Byl, Nr. 1477, Woodbush, Transvaal.

This most interesting species has cystidia characteristic of the section *Tubuliferae* of *Peniophora*, whose walls are dissolved by KOH. The allantoid spores are also distinctive.

Though the species is better known as *P. glebulosa* Bres., Rogers & Jackson, loc. cit., have pointed out that this name is invalid, and they published the new species *P. gracillima* Ell. & Everh. to take its place. Malençon (in Bull. Soc. Myc. de Fr. 70, 1954, 139) gives useful notes on the taxonomy and nomenclature of this species. According to Malençon the cystidia are amyloid. Donk (in Fungus 26, 1956, pp. 13–16) retains the epithet *glebulosa* for this species and places it in a new genus *Tubulicrinis* Donk, which appears to be a distinctive and well-founded genus. He characterises the cystidia as “lyocystidia”.

5. *Peniophora incarnata* (Pers. ex Fr.) Karsten; Recorded for South Africa by Doidge in Bothalia 5 (1950) 486.

The specimen for this record, Scott No. 33768, is a member of the *Coloratae* group of *Peniophora*, but differs from *P. incarnata* in colour and in its lack of gloeocystidia. It is close to *Peniophora versicolor* (Bres.) Sacc. & Syd., as described and figured by John Eriksson (in Symb. Bot. Uppsal. X: 5, 1950, 18) but differs in colour and in having larger cystidia. It may represent a new species, but requires further study.

6. *Peniophora longispora* (Pat.) Höhnelt var *brachyspora* Talbot & Green var. nov.

FIG. 26.

Resupinate, very thin, easily separable, pruinose-pellicular, with similar margin. Hymenium white, discontinuous, beset with emergent, hairlike, encrusted cystidia.

Basidia: clavate, usually with a basal clamp, $13-17 \times 3-4 \mu$ with four sterigmata up to 4 μ long.

Spores: elliptic-fusoid, $2.2-3.2 \times 6.4-8 \mu$, hyaline, smooth, sometimes with a faint band about the middle.

Cystidia: hyaline, cylindrical to acicular, tapering to a sharp subulate apex, thin-walled, with a wartlike, denticulate, incrustation or relatively large mineral granules, arising laterally from the subhymenial hyphae and emergent for most of their length, $3.2-3.5 \times 67-88 \mu$.

Hyphae: hyaline, loosely intertexted, thin-walled, smooth or a little encrusted, branched, septate, with abundant clamp connections, $2.5-3.2 \mu$ wide.

Specimens examined: Type, No. 40683 (T.R.L. 2901), *M. Mrost*, on underground timbers, Venterspost Mine, 27/vi/52.

The general aspect of this variety is very like that of *P. longispora*, but the latter is distinguished by having spores twice as long and somewhat narrower ($1.3 \times 12-18 \mu$ fide Bourdot & Galzin), and also in having a bulbous base to many of the cystidia. The pruinose-pellicular fructifications, loose hyphae with clamps, characteristic cystidia and banding of the spores are distinctive of both. The faint banding of the spores is probably due to the formation of two polar guttules.

Another very similar fungus, possibly to be included under var *brachyspora* is No. 40979, Talbot, on *Populus deltoides*, Piet Retief. This has bulbous-based cystidia like *P. longispora*, but its spores measure $1.6-2 \times 6.4-8 \mu$ and are cylindric-curved. That is, the spores correspond in length but not in shape with those of var *brachyspora*. Bourdot & Galzin describe several varieties of *P. longispora* with varying shapes and sizes of spores. None had spores as short as the present collections, and their length is rather constant.

The spores of *P. longispora* var *brachyspora* correspond in length with those of *Peniophora soraria* G. H. Cunn. (Cunningham in Trans. Roy. Soc. N.Z. 83, 1955, 280, f. 18) but the latter differs in having wider, less fusoid spores, $4-5 \mu$ wide, and wider cystidia, $5-7 \mu$ wide.

Peniophora longispora (Pat.) Höhnelt var *brachyspora* Talbot & Green var. nov.

Fungus resupinatus, albidus, pruinoso-pelliculatus, margine simili. Basidia clavata, $13-17 \times 3-4 \mu$, ad basem nodoso-septata, sterigmatibus 4, usque ad 4μ longis. Sporae elliptico-fusoideae, hyalinae, leves, interdum virga pallida circum mediam sporam, $2.2-3.2 \times 6.4-8 \mu$. Cystidia hyalina, cylindracea vel acicularia, apicibus subulatis, tenue tunicata, emergentia, granis verrucosis complanatis incrustata, $3.2-3.5 \times 67-88 \mu$. Hyphae hyalinae, laxae intertextae, tenue tunicatae, leves vel parum incrustatae, nodoso-septatae, $2.5-3.2 \mu$ diam. Typus No. 40683 (T.R.L. 2901), *M. Mroost*.

7. *Peniophora nuda* (Fries) Bresadola in I. R. Accad. Agiati Atti iii, 3 (1897) 114; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 17; Doidge in Bothalia 5 (1950) 486.

Corticium nudum Fries, Epicrisis Syst. Myc. (1838) 564.

Thelephora nuda Fries, Syst. Myc. 1 (1821) 447.

The only collection of this species recorded for South Africa is *Medley Wood* No. 161. I have not been able to trace this collection in any herbarium.

8. *Peniophora papyrina* (Mont.) Cooke in Grevillea 8 (1880) 20; South African Records cited by Doidge in Bothalia 5 (1950) 486.

Stereum papyrinum Montagne.

Welwitsch, Iter Angolense No. 433, cited by Doidge is a specimen of *Stereum fulvum* (Lév) Sacc., with pseudosetae derived from the ends of skeletal hyphae. *Peniophora papyrina* has a rather similar external appearance, but its skeletal hyphae are modified apically into wider, more peniophoroid cystidia resembling those of *Stereum umbrinum*.

The other specimen of *P. papyrina* mentioned by Doidge has not been traced. It seems dubious whether the species is represented in South Africa.

9. *Peniophora pruinata* (B. & C.) Burt in Ann. Mo. Bot. Gard. 12 (1925) 340; Doidge in Bothalia 5 (1950) 486.

Stereum pruinatum Berk. & Curt. (!) in Journ. Linn. Soc. Bot. 10 (1868) 332.

This species is discussed under *Stereum pruinatum* B. & C. in Bothalia 6 (1954), 323. The only specimen recorded for South Africa under this name, *MacOwan* (1227) in Herb. Kew., is not determinable, but lacks cystidia and does not match the type of *S. pruinatum* in several other respects. *P. pruinata* must be omitted from South African records.

10. *Peniophora pruinosa* (Pat.) Jackson in Canad. Journ. Res. 28 (1950) 530, f. 2.

Corticium pruinsum Pat., Cat. rais. pl. cell. Tunisie (1897) 60; Saccardo, Syll. Fung. 14 (1899) 222.

Peniophora chordalis Höhn. & Litsch. in K. Akad. Wiss. Wien Sitzungsab. 115 (1906) 1598; Bourdot & Galzin, Hym. de Fr. (1928) 280; Wakefield in Trans. Brit. Myc. Soc. 35 (1952) 58, f. 34.

Peniophora subgelatinosa Litsch., Österr. Bot. Zeitschr. 77 (1928) 128. Above synonymy after Jackson loc. cit.

FIG. 30.

Resupinate, effuse, inconspicuous, gelatinous, to mucoid when fresh, hyaline or blue-grey, drying as a greyish vernicose film which is white-pruinose under the lens showing protruding cystidia, adnate, not more than about 50 μ thick.

Basidia: not seen (fide Jackson "cylindric or cylindric-clavate, $15-25 \times 7.5-8 \mu$ with (4)–5–6–(7) short sterigmata").

Spores: hyaline, appearing smooth in KOH but actually minutely punctate all over as seen under oil immersion in lactic acid mounts, not amyloid, ovate-elliptical often with one flat side, laterally apiculate, $5-6-(7) \times 3-4 \mu$.

Cystidia: projecting for most of their length, hyaline, smooth, not encrusted, tapering from base to rounded apex, the base thick-walled and $8-11 \mu$ wide often showing one or two short rootlike branches, the apex thin-walled and $4.5-6 \mu$ wide. The cystidia are $60-120 \mu$ long and in old collections may break off leaving the thick-walled basal part behind as a short tubule.

Cystidioles: rare and not well shown in our material, but $45-50 \times 4 \mu$ with a simple or shortly lobed capitate apex. (Fide Jackson, "Cylindric or tapering gradually from base to apex, $25-45-(60) \times 2.5-3.5 \mu$, wall slightly thickened below, apex occasionally simple or capitate when young, more commonly with 3–5 short, blunt lobes").

Hyphae and Tissues: gelatinised and obscure.

Specimens examined: 39051, *W. G. Rump*, Town Bush Valley, Pietermaritzburg.

There is very little material of this collection but fortunately just enough to see the characteristic texture of the fructification and the spores and cystidia. No basidia and only two cystidioles were found.

This species differs from *Peniophora rimicola* (see next entry) in the smaller spores, in the apically lobed cystidioles, and in having basidia with a greater number of sterigmata.

11. *Peniophora rimicola* (Karst.) Höhnelt & Litsch. in K. Akad. Wiss. Wien Sitzungsber. 115 (1906) 1556; Bourdot & Galzin, Hym. de Fr. (1928) 281; Rogers in Univ. Iowa Stud. Nat. Hist. 17 (1935) 31; Jackson in Canad. Journ. Res. 28 (1950) 527, f. 1.

Corticium rimicolum Karsten in Hedwigia 35 (1896) 45; Saccardo, Syll. Fung. 14 (1899) 221.

FIG. 29.

Resupinate, effused, inconspicuous, gelatinous to mucoid when fresh, hyaline or grey-blue, drying to a grey-blue or whitish vernicose film which is white-pruinose under the lens showing numerous protruding cystidia, adnate but sometimes lifting as a vernicose flake, not more than about $50\ \mu$ in thickness.

Basidia: not seen (fide Jackson, "cylindric or somewhat clavate, $15-25 \times 7.5-8\ \mu$, base usually obscure, sometimes bifurcate, bearing 2, 3 or 4 short arcuate sterigmata $3-4\ \mu$ long").

Spores: hyaline, appearing smooth in KOH but actually minutely punctate all over as seen under oil immersion when mounted in lactic acid, not amyloid, broad ovate-elliptical, often with one side flattened, laterally apiculate, $(5.6)-6.4-7-(8.8) \times 8-10-(12)\ \mu$.

Cystidia: projecting for most of their length, hyaline, smooth, not encrusted, tapering from base to rounded apex, the base thick-walled and $8-11\ \mu$ wide often showing one or two short rootlike branches, the apex thin-walled and $4.5-6\ \mu$ wide. The cystidia are $60-120\ \mu$ long and in old collections may break off leaving the thick-walled part as a short tubule.

Cystidioles: present but not well shown in our material. (Fide Jackson, "cylindrical or slightly clavate, $25-35 \times 2-3\ \mu$, simple, or more commonly capitate at the apex to $3-5\ \mu$ ").

Hyphae and Tissues: gelatinised and obscure.

Specimens examined: 30952, *P. H. B. Talbot*, on *Eucalyptus*, Buffelspoort Expt. Stn.; 41024, *P. H. B. Talbot*, on *Populus deltoides*, Piet Retief; also collected on dead wood at Fountains, Pretoria, 24/X/1948.

These dried collections were not in prime condition for examining and describing. The basidia and hyphae were not clearly seen and the cystidioles were scanty and inconclusive, but in other essentials they agree very well with Jackson's excellent account of this species.

Jackson characterises the *P. rimicola* group by their mucous-gelatinous fructifications which are often bluish and pruinose, and dry to a vernicose film. They tend to produce marginal or superficial cordlike mycelial strands. Their tissues are gelatinised and rather featureless, but the cystidia and cystidioles are distinctive, as also are the non-amyloid minutely roughened spores. The basidia in *P. rimicola* are categorised as "pleurobasidia" by Donk (in Reinwardtia 3, 1956, 370-371).

12. *Peniophora tenuis* (Pat.) Masee in Journ. Linn. Soc. Bot. 25 (1889) 149; Burt in Ann. Mo. Bot. Gard. 12 (1926) 317; Rogers and Jackson in Farlowia 1 (1943) 322.

Corticium praetermissum (Karst.) Bresadola in Ann. Mycol. 1 (1903) 100.

Sebacina africana Burt (!) in Ann. Mo. Bot. Gard. 13 (1926) 338; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 20, f. 4; Doidge in Bothalia 5 (1950) 475; McGuire in Lloydia 4 (1941) 43.

For an extensive synonymy and discussion see Rogers & Jackson loc. cit.

FIG. 27.

Resupinate, effused, adnate, whitish, becoming light creamy or isabelline. Hymenium smooth, becoming vaguely granular to almost poroid in parts, not cracking.

Margin thin, indeterminate. Thickness in section about 100–130 μ .

Basidia: subcylindric, closely compacted, 5–6.5 μ wide.

Spores: cylindrical, oblong or ellipsoid with one side flattened, not amyloid, hyaline, sometimes guttulate, $3\text{--}5 \times 7\text{--}10 \mu$.

Gloeocystidia or Cystidia: embedded in all parts of the trama but especially arising from the basal tissues, ventricose, fusiform or subcylindrical, with pale yellowish or hyaline, homogeneous contents, yellow in Iodine, very variable in size, $8.5\text{--}12 \times 39\text{--}135 \mu$; a few of these bodies may be emergent, subcylindrical, with colourless contents, smooth or slightly encrusted, cystidioid.

Hyphae: colourless, not encrusted, very compact and difficult to distinguish, forming a dense tissue, mostly 3–5 μ wide.

Specimens examined: 39088 (T.R.L. 2436), *James & Breyer*, on underground timbers, C.M.R., Johannesburg, 1949.

The identification of the above specimen was confirmed by Dr. D. P. Rogers. We have followed Rogers & Jackson, loc. cit., in their interpretation of *P. tenuis* as a variable complex of species. In some of its forms it might easily be taken for a gloeocystidiolate *Corticium*; in others the emergent cystidia are more conspicuous and it is readily placed in *Peniophora*. The cystidioid organs are especially variable in size and degree of exsertion, but the spores are rather characteristic of the group. The Transvaal specimen had a denser trama than is often seen in this group. The same tendency was noted in specimens of *Corticium punctulatum* recovered from underground timbers.

The type specimen of *Sebacina africana* Burt was examined in Universiteit van Stellenbosch, Herbarium P. A. van der Byl No. 1342, Knysna. The spores measured $9\text{--}13 \times 3\text{--}5 \mu$, and the other characters agree with the *P. tenuis* group, to which *S. africana* is here assigned.

13. *Peniophora velutina* (DC. ex Fr.) Cooke; Recorded by Doidge in Bothalia 5 (1950) 487.

The specimen on which this record is based, No. 27764 (*Rump* 117), is *Peniophora roumeguerii* Bres.

MERULIUS Haller ex Fr.

1. *Merulius confluens* Schweinitz, Naturforsch. Ges. Leipzig 1 (1822) 92; Nel in Ann. Univ. Stellenbosch 20 (1942) 77.

Nel's record of this species for South Africa is based on the specimen in Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nr. 753. I am unable to differentiate this specimen from *Merulius corium* (Pers. ex Fr.) Fr. (Compare Bothalia 6, 1951, 30).

Cunningham (in D.S.I.R. New Zealand Bull. No. 83, 1950, 6) states that *M. confluens* differs from *M. corium* in having a darker hymenium with deeper pores, smaller spores, and context hyphae which are thinner-walled, often collapsing, and usually (but not always) coated with crystals.

2. *Merulius lacrymans* Wulf. ex Fries, Syst. Myc. 1 (1821) 328; Doidge in Bothalia 5 (1950) 502.

Boletus lacrymans Wulfen in Jacquin, Misc. Austr. 2 (1781) 111.

Mycelium loosely intertexted in a thick felted mat, fibrous, often with conspicuous strands, whitish to pale fawn coloured. Fructification resupinate, widely effused and sometimes reflexed, thick, spongy to fibrous-fleshy, readily separable from the substratum. Surface light brown to greyed-brown. Hymenium gyrose, somewhat poroid or becoming flattened-dentate or raduloid. Pores 1–2 mm diam. and about half as

deep, rust coloured, ferruginous yellow to Brussels brown or Sepia. Margin widely sterile, pale to fawn colour, more or less tomentose. Thickness in section 2 mm or more.

Basidia: clavate, $6.4-8 \times 50 \mu$, with 4 sterigmata; accompanied by narrow paraphysoid hyphae about 2μ diam.

Spores: ellipsoid with one side often flattened, bright ochraceous or honey yellow, $4.8-6.4 \times 9.6-12.8 \mu$, frequently guttulate.

Hyphae: (1) coloured, thick-walled, with a narrow or invisible lumen, $5.6-8-(11.2) \mu$ wide; (2) hyaline, thin-walled, with clamps, $3-6.4 \mu$ wide, sometimes with the wall thickening slightly.

I have examined all the specimens listed under this name by Doidge (loc. cit.), and am not quite convinced that any of them is *M. lacrymans*, since they are either sterile mycelium or, if fertile, differ in being considerably darker in colour than typical *M. lacrymans*. This may be due to the way these specimens have been preserved, and I have thought it advisable to give the above description drawn up from freshly collected English material (Nos. 35772, 35927, 36685, *P. H. B. Talbot*, Richmond, Surrey, on timber in a house).

M. lacrymans is usually confused with *M. himantoides* in South Africa. The hymenium of the latter is not rusty-coloured but has a darker, sordid colour. Its hyphae, both hyaline and coloured, are thin-walled and they often become inflated and then collapse readily.

3. *Merulius molluscus* Fries, Syst. Myc. 1 (1821) 329; Saccardo, Syll. Fung. 6 (1888) 416; Bourdot & Galzin, Hym. de Fr. (1928) 351.

Merulius fugax Fries sensu Burt in Ann. Mo. Bot. Gard. 4 (1917) 352, f. 33.

Merulius laeticolor Berk. & Br. in Ann. Nat. Hist. n. 1681; Saccardo Syll. Fung. 6 (1888) 417.

FIG. 31.

Resupinate, effused, membranous, very soft, readily separable. Hymenium tan, creamy, pinkish buff to orange tinted, gyrose-plicate. Margin byssoid, whitish to pale buff coloured. Context soft, byssoid to fibrillose, less than 300μ thick in section.

Basidia: clavate, sometimes with a basal clamp, $5-9 \times 23-35 \mu$, with four short sterigmata.

Spores: smooth, hyaline, becoming very pale yellow, oblong-ellipsoid, $5-6 \times 3-4.5 \mu$, commonly with 1-2 small guttules.

Hyphae: $3.5-7 \mu$ wide, thin-walled, with abundant clamps which are often anisiform, much branched, hyaline and smooth in the upper parts but granule-encrusted and rarely pale-tinted in the basal tissues, all loosely intertexted.

Specimens examined: No. 41054, *E. L. Stephens* (679), on fir log, Cecilia Forest Plantation, Cape; Rabenhorst Fungi Europaei (No. 3034), *E. Marchal*, Belgium.

The notes given by Burt and by Bourdot & Galzin show that there is some doubt as to the typification of *M. fugax* and *M. molluscus*. I have followed Bourdot & Galzin in adopting the name *M. molluscus* for this species since it conforms closely with the good description given by Fries, whereas Fries' description of *M. fugax* is poor and could apply to several different species.

M. molluscus is distinctive but could possibly be confused with *M. corium* on account of its bright colour. The latter is distinguished by its hyaline spores, thick-walled hyphae lacking clamps, and effused, narrowly reflexed habit. *M. molluscus* is resupinate and at least some of its spores, sometimes the majority, are coloured a pale yellow.

4. *Merulius pinastris* (Fr.) Burt in Ann. Mo. Bot. Gard. 4 (1917) 356, f. 36; Doidge in Bothalia 5 (1950) 502.

Hydnum pinastris Fries, Obs. Myc. 1 (1815) 149, Syst. Myc. 1 (1821) 417.

Doidge records No. 27559, *R. Lurie*, New Modder Mine, Johannesburg, as *Merulius pinastris*. The fructification appears somewhat deformed, probably owing to the habitat, and is not determinable to species. It is not *M. pinastris* however, from which it differs in its colour and in the characters of its mycelium and spores.

5. *Merulius rufus* Pers. ex Fr.; Recorded by Doidge in Bothalia 5 (1950) 502.

One specimen only is cited in support of this record, viz. No. 27790 (*W. G. Rump* 86). This is quite clearly effuso-reflexed and possesses the colour and spores of *Merulius corium*. According to Burt (in Ann. Mo. Bot. Gard. 4, 1917, 338), *M. rufus* is fawn to carob-brown or Natal Brown in colour, and its spores are $4.4.5 \times 1.5-2.5 \mu$, and it is truly resupinate. *M. rufus* should be omitted from South African records.

6. *Merulius serpens* Tode ex Fries, Syst. Myc. 1 (1821) 327; Kalchbrenner in Grevillea 10 (1881) 57; Doidge in Bothalia 5 (1950) 502.

Kalchbrenner published a collection of *MacOwan*, Somerset East, as this species. This collection has not been traced in any herbarium and the record cannot be confirmed.

7. *Merulius tremellosus* Schrad. ex Fr., Syst. Myc. 1 (1821) 327; Doidge in Bothalia 5 (1950) 503.

This record is based on No. 1350, *E. M. Doidge*, Garstfontein, Pretoria. The specimen is clearly *M. corium* and not *M. tremellosus*, which differs in habit, the possession of very small allantoid spores, and in having a hymenium composed of radially elongated shallow pores which become transversely ridged.

TOMENTELLA Patouillard.

1. *Tomentella punicea* (A. & S. ex Fr.) Schroet; Bourdot & Galzin, Hym. de Fr. (1928) 491.

Hypochnus puniceus (A. & S. ex Fr.) Saccardo, Syll. Fung. 6 (1888) 661; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 19; Doidge in Bothalia 5 (1950) 479.

Thelephora punicea A. & S. ex Fries, Elenchus Fung. (1828) 199; Alb. & Schw. Consp. Fung. Lusatae (1805) 278; Kalchbrenner in Grevillea 10 (1881) 58; Wood in Rept. Natal Bot. Gard. (1898) 19.

This record for South Africa is based on *J. M. Wood* No. 190 which has not been traced in any herbarium. The record is therefore doubtful. The following is a translation of the description of this species given by Bourdot & Galzin, loc. cit.

Formed of powdery granules, then confluent into a soft, floccose membrane, loosely felted, slightly adherent, red-vermilion colour rarely persistent but passing into a red-brown or brick red. Margin clear, arachnoid, or absent. Hyphae hyaline, thin-walled, clamped, $3-6(9) \mu$, the basal ones tinted bistre-yellow. Basidia $30-42-50 \times 6-7-10 \mu$, with 2-4 more or less arcuate sterigmata $6-8 \mu$ long. Spores globose or ovoid, rather regularly sinuate and asperulate, $7-8-12 \times 5-7.5-9 \mu$, 1-guttulate, hyaline, containing, as do the basidia and subhymenial hyphae, a red material which is soluble in KOH and becomes brown.

2. In *Bothalia* 6 (1951) 63 the writer listed *Hypochnus eylesii* van der Byl (in S.A. Journ. Sci. 22, 1925, 168 and in Ann. Univ. Stellenbosch 7, 1929, 18) under *Tomentella*, without having seen material of this species.

Part of the type collection of *H. eylesii* was eventually located in Herbarium Len Verwoerd (30) at the Stellenbosch-Elsenburg College of Agriculture. On study, this proved to be *Corticium punctulatum* Cooke sensu Rogers & Jackson (in Farlowia 1, 1943, 320).

HYMENOCHAETE Léveille.

My studies of *Hymenochaete* in South Africa are incomplete and must remain so pending a wider study of the genus. The collections can quite readily be arranged in taxonomic species and it is often possible to say that a particular collection does not represent the species under which it has been recorded. Its true identity is far more difficult to establish, and in many instances this has not yet been done.

1. *Hymenochaete dregeana* (Berk.) Massee in Journ. Linn. Soc. Bot. 27 (1890) 114; Doidge in *Bothalia* 5 (1950) 484.

Corticium dregeanum Berk. (!) in Hooker's Lond. Journ. Bot. 5 (1846) 3.

In *Bothalia* 6 (1954) 344, the writer showed that the type of this species, *Drège* 9451 c, should be referred to *Irpex dregeanus* (Berk.) Talbot.

2. *Hymenochaete fulva* Burt in Ann. Mo. Bot. Gard. 5 (1918) 354; Doidge in *Bothalia* 5 (1950) 484.

The record rests on Doidge's citation of Nos. 34356, 34386, and 35325 as this species. The first two of these are co-specific but neither they nor the last-mentioned specimen correspond with *H. fulva*. No. 35325 is close to *H. fulva* in structure, but lacks cystidia and has much smaller setae.

3. *Hymenochaete fusco-violascens* (Mont.) van der Byl in Ann. Univ. Stellenbosch 7 (1929) 14; Doidge in *Bothalia* 5 (1950) 484.

Thelephora fusco-violascens Mont. in Ann. Sci. Nat. ser. iii, 7 (1847) 174; Saccardo Syll. Fung. 6 (1888) 546.

This record is based on the collection of *Drège* (9429) from Durban. There does not appear to be a specimen in existence. The short description, apart from the dark violaceous colour of the hymenium, could fit many different species.

4. *Hymenochaete luteobadia* (Fr.) Höhnelt & Litsch. in K. Akad. Wiss. Wien Sitzungsber. 116 (1907) 754; Burt in Ann. Mo. Bot. Gard. 5 (1918) 323, f. 8; van der Byl in Ann. Univ. Stellenbosch 7 (1929) 13, f. 2; Doidge in *Bothalia* 5 (1950) 485.

Stereum luteobadium Fr., Epicr. Syst. Myc. (1838) 547; Saccardo, Syll. Fung. 6 (1888) 571; Kalchbrenner in Grevillea 10 (1881) 58; Bottomley in S.A. Journ. Sci. 13 (1916) 440.

FIG. 34.

Pileate, dimidiate; surface of pileus coloured Argus Brown to Sayal Brown (Ridgway), velutinate to tomentose. Margin entire, undulating, thin, concolorous. Hymenium coloured Buckthorn Brown to Tawny Olive (Ridgway), smooth, concentrically furrowed like the abhymenial surface. Thickness in section 300–400 μ .

Basidia & Spores: not seen.

Setae: $35-50 \times 4-6 \mu$, scanty, in a single layer projecting above the hymenium.

Hyphae: brown, smooth, 2μ wide.

Abhymenial hairs: similar to hyphae.

Tissue differentiation: there is a compact darker zone between the hyphae of the context and the abhymenial hairs.

Specimens examined: No. 15558, *W. Haygarth*, Ngoye (as *Stereum villosum*); 11974, *R. Dümmer*, Kyague, Uganda; 14884, *T. D. Maitland*, Gongoni, Kenya; Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nrs. 146, 692, 523.

5. *Hymenochaete nigricans* (Lév.) Bresadola; Doidge in *Bothalia* 5 (1950) 485.

Stereum nigricans Léveillé in *Ann. Sci. Nat. ser. iii*, 2 (1844) 212; Saccardo, *Syll. Fung.* 6 (1888) 561.

FIG. 35.

Pileate, dimidiate; surface of pileus coloured Mars Brown to Chestnut Brown (Ridgway), thickly matted with a soft, spongy, tomentum, concentrically furrowed. Margin concolorous, undulating to slightly lobate, thin. Hymenium coloured near Mummy Brown (Ridgway), smooth, somewhat furrowed. Thickness in section (excluding surface hairs) about 150μ .

Basidia & Spores: not seen.

Setae: in a single layer, projecting from the hymenium, $(20)-35-40 \times (6)-8-10 \mu$, spaced well apart.

Hyphae: brown, smooth, $2-4.5 \mu$ wide, arranged mostly parallel to the hymenium, running out into abhymenial hairs with no dark or compact zone in between.

Abhymenial hairs: brown, smooth, $3-5 \mu$ wide.

Specimens examined: *MacOwan*, Cap. b. sp. (sub *Stereum percome* in *Herb. Kew.*).

The specimen cited by Doidge as *H. nigricans*, No. 15558, *Haygarth*, is instead *Hymenochaete luteobadia*. The latter differs from *H. nigricans* in having longer, thinner and more delicate setae, which are also sparser, in the presence of a basal seam, in colour, and in having a thinner tomentum on the surface.

The MacOwan specimen cited above corresponds in detail with *Hymenochaete spadicea* Berk. which, as indicated by Bresadola (in *Ann. Mycol.* 14, 1916, 233) is a synonym of *H. nigricans*.

6. *Hymenochaete rubiginosa* (Dicks. ex Fr.) Léveillé in *Ann. Sci. Nat. ser. iii*, 5 (1846) 151; Burt in *Ann. Mo. Bot. Gard.* 5 (1918) 332, f. 11; Masee in *Journ. Linn. Soc. Bot.* 26 (1890) 97; van der Byl in *Ann. Univ. Stellenbosch* 7 (1929) 14; Doidge in *Bothalia* 5 (1950) 485.

Thelephora rubiginosa Dicks. ex Fr., *Syst. Myc.* 1 (1821) 436.

Stereum rubiginosum (Dicks. ex Fr.) Fr., *Epicr.* (1838) 550; Montagne in *Ann. Sci. Nat. ser. iii*, 7 (1847) 174.

The original South African record of this species was based on *Drège* No. 9450, which I have not been able to locate in any herbarium. No. 30260 cited by Doidge as this species is referred to *Hymenochaete ochromarginata* Talbot.

7. *Hymenochaete tabacina* (Sow. ex Fr.) Lév. in Ann. Sci. Nat. ser. iii, 5 (1846) 152; Doidge in Bothalia 5 (1950) 485.

Thelephora tabacina Sow. ex Fr., Syst. Myc. 1 (1821) 437.

Auricularia tabacina Sowerby, Brit. Fung. (1797) pl. 25.

Of the specimens cited by Doidge for South Africa, I have been unable to locate Cheesman, Groot Schuur. No. 27627, *Rump*, is a specimen of *Stereum umbrinum*. No. 28287, *Rump*, is a species of *Hymenochaete* but not *H. tabacina*.

The MacOwan specimen cited by Doidge under *H. tabacina* var *australis* has not been located. This variety is held to be a synonym of *H. tabacina*.

8. *Hymenochaete tenuissima* Berk (!) in Journ. Linn. Soc. Bot. 10 (1868) 333; Doidge in Bothalia 5 (1950) 485.

Doidge cites two specimens, of which that collected by Cheesman has not been located. No. 15596, *Haygarth*, is a polypore, *Polystictus tabacinus* Mont.

9. *Hymenochaete tristicula* (B. & Br.) Masee; Doidge in Bothalia 5 (1950) 485.
= *Duportella tristicula* (B. & Br.) Reinking. See Bothalia 6 (1951) 46.

ODONTIA Pers. ex S. F. Gray.

1. *Odontia bicolor* (Alb. & Schw. ex Fr.) Bresadola in Ann. Mycol. 1 (1903) 87; Bourdot & Galzin, Hym. de Fr. (1928) 429, f. 115; Miller in Mycologia 26 (1934) 27, Pl. 3, f. 5; Brown in Bot. Gaz. 96 (1935) 658, f. 14; Nobles in Canad. Journ. Bot. 31 (1953) 745-749, Figs. 1-7.

Hydnum bicolor Alb. & Schw. ex Fr., Syst. Myc. 1 (1821) 417.

FIG. 32.

Resupinate, widely effused, pruinose to ceraceous in parts, white, becoming creamy. Margin pruinose, white to creamy, indeterminate. Teeth variable, conical, subulate or cylindrical, up to 0.4 mm long, often divided above into several points, the apices usually fimbriate, composed of sterile hyphal ends with rounded or acute tips, projecting about 50-60 μ and each 2.5-3 μ diam. Forming a profuse mycelium and white rot within the substratum.

Basidia: clavate, 15-20 \times 4-5 μ , with 2-4 sterigmata up to 5 μ long.

Spores: (not seen in South African material) elliptic-oblong with the base obliquely attenuated, hyaline, (5.5)-7-(8) \times (2.5)-3.3-(4) μ .

Cystidia: capitate (1) composed of an axis (2)-4-6 μ wide and 15-20 μ long whose globose apex is surrounded by a smooth, thin-walled, globose envelope, sometimes with yellowish contents, easily collapsing, 10-20 μ diam. In some of these cystidia the end of the axis is blown out into the envelope and no columella-like part is seen; (2) other cystidia composed of a thinner axis, usually about 3 μ diam. whose enlarged end is surmounted by a crest of radiating acicular crystals about 8-12 μ diam.

Hyphae: subicular hyphae are hyaline, branched, septate, with clamps, thin-walled, 1.5-2 μ wide; the hyphae in the teeth are 2-3 μ wide, easily collapsing, hyaline, thin-walled, sometimes with clamps.

Crystals: radiating acicular crystals are abundant in all parts of the fructification.

Specimens examined: 36792, *N. Eaton*, on worked *Pinus* timber, Potchefstroom; 39046, *P. H. B. Talbot*, on *Eucalyptus*, Lions River, Natal.

The peculiar capitate and mineral-encrusted cystidia, the radiating groups of crystals, and the dense white rot of the substratum, are characters by which this species is easily recognised. Nobles loc. cit. describes this fungus in culture and the important rot of conifers and frondose trees that it produces.

GRANDINIA Fries.

1. *Grandinia rosea* P. Hennings in Engler Jahrb. 38 (1905) 108; Saccardo, Syll. Fung. 21 (1912) 379; van der Byl in Ann. Univ. Stellenbosch 12 (1934) 8.

FIG. 33.

Resupinate, widely effused, with rather soft to membranous or spongy texture, sometimes becoming crustose, coloured rosy to terra cotta or brick red. Margin fibrillose to byssoid. Hymenium covered with small (180–200 μ diam., fide Hennings) half-round tubercles or with short raduloid or more or less cylindrical teeth. The tubercles and teeth are fertile and without setoid hairs or cystidia.

Basidia: cylindric-clavate, about $19\text{--}29 \times 3\text{--}4 \mu$, with usually 2 very short sterigmata ($14\text{--}18 \times 3\cdot5\text{--}5 \mu$ fide Hennings).

Spores: subglobose to ovate, or elliptical with one side flattened, hyaline, smooth, $3\cdot2 \times 4\cdot8 \mu$ ($4\text{--}5 \times 4 \mu$ fide Hennings).

Hyphae: (1) layer next to substratum composed of compact horizontal adherent hyphae with firm walls, septate, colourless, tending to collapse, $3\text{--}7 \mu$ wide; (2) middle and upper tissues of colourless, branched, septate, collapsing hyphae, $4\text{--}6\cdot5 \mu$ wide, arranged more or less vertically and more loosely than the basal layer. No hyphae are very clear. Airspaces common in the middle layers.

Specimens examined: Universiteit van Stellenbosch, Herbarium P. A. van der Byl Nr. 706.

This is a distinctive species on account of its colour, soft and membranous to spongy texture, and hyphae which are mostly widely spaced. *Grandinia* may not be the most suitable genus for this species, but a better one cannot yet be suggested.

SISTOTREMA Fries emend. Donk.

1. *Sistotrema muscicola* (Pers.) Lundell apud Lundell & Nannfeldt in Fung. Exsicc. Suecici Fasc. xxix–xxx (1947) 11, No. 1415 a.

Hydnum muscicola Pers., Myc. Eur. 2 (1825) 181.

Grandinia muscicola (Pers.) Bres. apud Bourd. & Galz. in Bull. Soc. Myc. Fr. 30 (1914) 252, Hym. de Fr. (1928) 411, f. 112.

Trechispora muscicola (Pers.) Rogers in Mycologia 36 (1944) 83, f. 3.

FIG. 36.

Fructifications resupinate, consisting of delicate spines up to 1 mm long borne on a separable pellicular to membranous subiculum, fragile, cream to ochraceous in colour, with a pellicular, paler, sterile margin. The fructification is occasionally poroid.

Basidia: Obovate when immature, later becoming urnigerous, with a short, subcylindrical apical protrusion, not expanded at the apex, $13\text{--}20 \times 6\cdot4\text{--}6\cdot8 \mu$, with (4)–6 short sterigmata up to $3\cdot5 \mu$ long.

Spores: subglobose to broad ovate or ellipsoid, shortly attenuated at the base, $2\cdot7\text{--}3\cdot6 \times 2\cdot3\text{--}2\cdot7 \mu$, smooth, hyaline ($4\text{--}5\cdot5 \times 3\text{--}3\cdot5 \mu$, fide Rogers; $3\text{--}4\cdot5 \times 2\cdot5\text{--}4 \mu$, fide Bourdot & Galzin; $3\text{--}4\cdot5 \times 3\cdot5 \mu$ fide Lundell).

Hyphae: thin-walled, smooth, hyaline, readily collapsing in parts, with large, inflated clamp connections up to $7\text{--}10 \mu$ wide, the rest of the hyphae being only $2\cdot5\text{--}5\cdot5 \mu$ wide.

Specimens examined: 40671, *Distr. Forest Officer*, on dead *Pinus pinaster* near soil level, Knysna, Woodville Plantation.

In the specimen examined, the spores are somewhat smaller than as usually described for this species, but there appears no doubt as to its identity. Rogers (Loc. cit.) separated *Trechispora* for resupinate species with urnigerous basidia, from *Sistotrema* which he limited to pileate species. This treatment is not supported by Lundell, nor by Eriksson (Svensk. Bot. Tidskr. 43, 1949, 312). I have here followed the Swedish view, since it seems in this instance that the distinction between resupinate and pileate species is too slight to be of generic significance. (See also Donk in Fungus 26, 1956, 4.).

2. *Sistotrema brinkmanni* (Bres.) J. Eriksson in K. fysiogr. Sällsk. Lund Forh. 18 (1948) 17.

Odontia brinkmanni Bres. in Ann. Mycol. 1 (1903) 88.

Trechispora brinkmanni (Bres.) Rogers & Jackson in Farlowia 1 (1943) 288; Rogers in Mycologia 36 (1944) 88.

Corticium coronilla Höhn. apud Höhn. & Litsch. in Ann. Mycol. 4 (1906) 291; Biggs in Mycologia 29 (1937) 686.

FIG. 38.

Fructification resupinate, very thin and delicate, pruinose to waxy or later thin membranous, drying inconspicuous, white to yellowish, the hymenium even or minutely papillate, the margin pruinose or finely fibrillose, sometimes accompanied in culture by dark sclerotia or bulbils.

Basidia: 13·5–16·5 μ long, formed in clusters, urniform, composed of a swollen base 4–5 μ wide, often with a subtending clamp connection, and a long narrower apical part 2·7–3·8 μ wide expanded somewhat below the corona of (4)–6–8 sterigmata. Sterigmata curved, about 3·5 μ long.

Basidiospores: ellipsoid to subcylindric, usually unilaterally depressed or flattened, apiculate, smooth, 4·4–5·4 \times 1·9–2·6 μ .

Hyphae: thin-walled, smooth, with abundant large clamps, (1·9)–4·5–7 μ wide becoming inflated into ampoullar hyphae at the clamps.

Bulbils: deep brown or light yellowish-brown, subspherical, 67–122 μ diam., composed of aggregated yellow-brown subspherical cells.

Other organs: Spherical cells 8–10 μ diam., hyaline, eventually detached. These are in the nature of chlamydospores and are produced in some cultures. Cylindrical, hyaline oidia are found in other cultures.

Specimens examined: 41739, *V. C. Green*, on imported Southern Pine beams in storage at West Rand Consolidated Mines, 22/3/57.

An extensive synonymy and description of this species is given by Rogers (1944) and Biggs (1937).

This collection was noted in the form of bulbils on timber intended for use in the mines, and the above description is drawn up from cultures made from the bulbils by Miss *V. C. Green*.

MISCELLANEOUS ADDENDA.

1. *Irpex dregeanus* (Berk.) Talbot and *Irpex vellereus* B. & Br.

D. A. Reid (in Kew Bull., 1955, pp. 631–648) holds *Irpex vellereus* apart from *I. dregeanus*, while acknowledging a very close relationship between the two species.

He differentiates them as follows:—

Irpex vellereus.—Spores 4·5–6 \times 2·5–3 μ ; Cystidia 3·5–5 μ wide.

Irpex dregeanus.—Spores 6·5–7 \times 4·5–5 μ ; Cystidia (5)–6–8 μ wide.

2. Synonymy of Various *Stereum* Species.

P. L. Lentz (in U.S. Dept. Agric. Agriculture Monograph No. 24, 1955, pp. 1-74) gives the following synonyms:—

Stereum diaphanum (Schw.) Cooke = *Cotilydia diaphana* (Schw.) Lentz.

Stereum bicolor (Pers. ex Fr.) Fr. = *Laxitextum bicolor* (Pers. ex Fr.) Lentz.

Stereum umbrinum B. & C. = *Laxitextum crassum* (Lév.) Lentz.

Stereum fasciatum (Schw.) Fr.

Stereum lobatum (Kunze ex Fr.) Fr.

Stereum concolor (Jungh.) Mont.

Stereum perlatum Berk.

} = *Stereum ostrea* (Blume & Nees ex Fr.) Fr.

3. *Lopharia*.

G. H. Cunningham (in Trans. Roy. Soc. N.Z. 83, 1956, 621) has emended the genus *Lopharia* Kalchbr. & MacOwan to contain pileate species of the Thelephoraceae bearing pedicellate cystidia. He typifies the emended genus by *Thelephora cinerascens* Schw., disregarding the fact that the type species of *Lopharia* was, and must remain, *L. lirellos* Kalchbr. & MacOwan as this genus was monotypic when it was proposed. In my opinion the structure of *Lopharia* is stereoid rather than peniophoroid, despite the presence of cystidia, and I would therefore retain *Stereum cinerascens* as a *Stereum*. However, if it should be necessary to differentiate it from *Stereum* because of the presence of cystidia, *S. cinerascens* is the type species of *Lloydella* Bres. which was differentiated from *Stereum* precisely because it possessed "metuloid" cystidia. On the other hand, *Lopharia* and *Thwaitesiella* Masee were originally erected on the nature of the hymenial configuration, which is variable and unreliable, and they would be better sunk under *Stereum* or *Lloydella* depending upon the emphasis given to the presence of the cystidia. It appears that Cunningham was not justified in emending *Lopharia* when *Lloydella* stands for exactly the same generic concept. Cunningham treats two species under his emended *Lopharia*, viz., *L. cinerascens* (Schw.) G. H. Cunn. and *L. vinosa* (Berk.) G. H. Cunn. (Syn. *Stereum umbrinum* B. & C.; *Thelephora crassa* Lév.). He thus associates a monomitic, typically resupinate species lacking a basal seam, with a dimitic, typically effuso-reflexed species possessing a basal seam. It is true that *Stereum umbrinum* is ill-placed in *Stereum*, and for that reason I would rather follow Lentz (U.S.D.A. Agric. Monogr. No. 24, 1955) in placing it in *Laxitextum* Lentz, if it is not to be retained in *Stereum*.

4. *Laeticorticium* Donk.

In proposing the new genus *Laeticorticium*, Donk (in *Fungus* 26, 1956, 16-17) makes the combinations *L. roseum* (Pers. ex Fr.) Donk and *L. polygonioides* (Karst.) Donk. These two species were treated previously under *Aleurodiscus* (in *Bothalia* 6, 1956, 470), but *Laeticorticium* appears to be a well-founded genus. Donk refers to the nodular dendroid hyphae as "dendrohyphidia".

5. *Scytinostroma* Donk.

In two previous papers (*Bothalia* 4, 1948, 939 and *Ibid.* 6, 1951, 54, Pl. 38) the author erred in using the generic name *Asterostromella* Höhn. & Litsch. (1907), since this is based on the same type as the earlier genus *Vararia* Karst. (1903). Donk has now proposed (in *Fungus* 26, 1956, pp. 19-22) the genus *Scytinostroma* Donk, to which he refers *Asterostromella duriuscula* (B. & Br.) Talbot, *Asterostromella rumpiana* Talbot and *Corticium portentosum* B. & C., at the same time differentiating this genus from *Vararia*.

SUMMARY OF THE RECORDED SOUTH AFRICAN THELEPHORACEAE.

This paper concludes a series of studies designed to revise the chaotic records of the South African Thelephoraceae principally at the specific and generic levels. The revision, carried out over a period of ten years, was based on a study of virtually every species, and the vast majority of preserved specimens, of the Thelephoraceae recorded for South Africa. Of necessity the results have been published in a number of apparently disconnected papers, and so it seems appropriate at this stage to summarise them by means of a key to the accepted species and a species-index of all the recorded South African Thelephoraceae. This is, however, only a beginning; there must still be a great number of other Thelephoraceae in this country awaiting collection and identification.

A KEY TO THE ACCEPTED GENERA AND SPECIES OF SOUTH AFRICAN THELEPHORACEAE.

1. Homobasidiomycetae, Aphyllophorales, Thelephoraceae:

- Basidiocarp pezizaeform, patelliform, cupulate or tubular, sessile or stipitate, the interior of the basidiocarp lined by the hymenium which may be smooth or wrinkled.
 Basidiocarps solitary to gregarious or confluent, at times seated on or embedded in a common floccose to membranous subiculum or stroma. . . . Subfamily Cyphelloideae 2.
- Basidiocarp resupinate, effuso-reflexed or pileate. Hymenium spread over shallow veins, anastomosing ridges, or sometimes imperfectly poroid from anastomosis of the veins. Texture usually soft, fleshy or subgelatinous. . . . Subfamily Meruloideae 3.
- Basidiocarp resupinate, effuso-reflexed or pileate, sessile or stipitate. Hymenium smooth or finely rugose or somewhat tuberculate, or bearing sterile hyphal pegs
 Subfamily Thelephoroideae 4.
- (Hymenium corticioid, hydroid or polyporoid. Basidia urniform, i.e. with a bulbous base and a narrower tubular prolongation with a crown of (4)–5–8 sterigmata

1. *Sistotrema*.)

2. Subfamily Cyphelloideae:

- Subiculum present as a membranous stroma in which are seated contiguous cupular basidiocarps. . . . 2. *Porothleum*.
- Subiculum absent. Basidiocarps discoid, patelliform or effused, coriaceous to fleshy-gelatinous. Hyphae usually gelatinised. Basidia and spores usually large. Paraphysoid structures common. . . . 3. *Cytidia*.
- Subiculum sometimes absent, if present then composed of floccose interwoven hyphae. Basidiocarps usually cupulate to tubular, sometimes patelliform. . . 4. *Solenia* and *Cyphella*.

(Compare also 16. *Aleurodiscus* and 18. *Dendrothele*.)

3. Subfamily Meruloideae:

- Hymenium covering plane to convex, discoid to elongated pulvinae separated by narrow sterile clefts containing mineral matter, and seated on a fleshy or subgelatinous stroma. Resupinate or reflexed to dimidiate. Hymenium containing brown or yellow dendrophyses and cemented by brownish granules. Tissue distribution *Stereum*-like. Gloecystidia present or absent. One species produces abundant conidia. . . . 5. *Punctularia*.
- Hymenium covering shallow anastomosing veins or pleats, alveolar or irregularly poroid; resupinate or pileate, often rather gelatinous. . . . 6. *Merulius*.

4. Subfamily Thelephoroideae:

- Hyphae brown, spores brown, setae or pseudosetae (setoid hyphae) absent. . . . 5.
- Hyphae brown, spores hyaline, setae or pseudosetae present (guard against taking intrusive skeletal hyphae or coloured cystidia as setae or pseudosetae). . . . 6.
- Hyphae hyaline or only faintly coloured, if the latter then the spores are hyaline; setae or pseudosetae absent; other ancillary organs may be present or absent. . . . 7.
5. Spores smooth; hymenophore resupinate, more or less membranous. . . . 7. *Coniophora*.
 Spores verrucose or echinulate; hymenophore resupinate, floccose. . . . (*Hypochnus*) =
 8. *Tomentella*.
- Spores verrucose to echinulate; hymenophore compact, subresupinate to usually pileate. . . . 9. *Thelephora*.

6. Setae present..... 10. *Hymenochaete*.
 Setae absent; pseudosetae present; gloeocystidia and cystidia also found at suitable stages of development, but often not seen..... 11. *Duportella*.
 Asteroetae present, see..... 17. *Asterostroma*.
7. Hymenophore effuso-reflexed to pileate, occasionally resupinate but then showing tissues differentiated into a hymenium separated from the basal mycelium by a more or less horizontal middle layer. Hyphae hyaline to faintly coloured, rarely dark. Spores hyaline, smooth, rarely stippled-punctate. Texture coriaceous to subligneous..... 8.
 Hymenophore resupinate with margin rarely free or only narrowly reflexed. Hyphae usually hyaline, loosely interwoven or if compact then more or less vertically arranged and lacking a differentiated middle layer. Spores hyaline, smooth. Texture arachnoid, pellicular, byssoid, membranous, or fleshy, not coriaceous to subligneous..... 9.
8. Hymenium smooth or irregularly rugose; Hyphae normal, capillary..... 12. *Stereum*.
 Hymenium smooth or irregularly rugose; Hyphae dendrophytic to dichophytic. Spores mostly subglobose and smooth or minutely stippled..... 14. *Asterostromella*.
 Hymenium covering radiating costate ribs and generally also coarsely papillate. Hyphae normal, capillary..... (*Cladoderris*) = 13. *Cymatoderma*.
9. Basidia not in a palisade, formed in loose botryose clusters from lateral branches of loosely interwoven repent hyphae. Texture arachnoid to pellicular, with generally wide, distinct hyphae, usually branching at right angles. Septate cystidia occasionally present..... 15. *Pellicularia*.
 Basidia forming a palisade hymenium above a more compact trama..... 10.
10. Basidia usually very large; spores usually large and often amyloid. Paraphysoid structures of various sorts (*Acanthophyses*, moniliform gloeocystidia, dendrophyses, pseudophyses) present..... 16. *Aleurodiscus*.
 Basidia and spores not usually large and seldom amyloid. Ancillary organs present or absent..... 11.
11. Asteroetae present..... 17. *Asterostroma*.
 Asteroetae absent..... 12.
12. Hyphal pegs present, composed of dendrophytic hyphae..... 18. *Dendrothele*.
 Hyphal pegs absent..... 13.
13. Hyphae dendrophytic to dichophytic..... 14. *Asterostromella*.
 Hyphae normal, capillary, not prolifically branched..... 14.
14. Possessing cystidia and sometimes cystidioles and/or gloeocystidia as well.... 19. *Peniophora*.
 Lacking cystidia; sometimes possessing gloeocystidia and/or cystidioles..... 20. *Corticium*.

THELEPHORACEAE (Pers.) Saccardo.

Saccardo, Syll. Fung. 11 (1895) 115.

Thelephoreae Persoon, Myc. Eur. 1 (1822) 109.

Hymenomycetes with inferior hymenium; hymenophore resupinate effuso-reflexed or pileate, sessile or stipitate. Hymenial layer smooth or rugulose or papillate, with continuous or discontinuous basidia, homobasidiate, frequently possessing various ancillary organs. Spores unicellular, smooth or sculptured, hyaline or coloured. Hyphae hyaline or coloured, with or without clamp connections, forming mono- or dimitic hyphal systems.

Genus 1. *Sistotrema* Pers. ex Fr., Syst. Myc. 1 (1821) 426, emend. Donk apud Rogers in Univ. Iowa Stud. Nat. Hist. 17 (1935) 19.

Fructification resupinate or reflexed to pileate. Hymenium smooth, granulose, toothed or poroid. Texture arachnoid, pellicular or membranous. Hyphae hyaline, with clamps. Basidia urniform, with a bulbous base and a narrower tubular prolongation bearing apically a crown of (4)–5–8 sterigmata. Spores smooth. Gloeocystidia present in some species.

The species of this genus show hymenial characters which are associated with several different Friesian families. The genus is included here because some of its species may be sought in the Thelephoraceae.

1. Resupinate, hydroid with delicate spines up to 1 mm long. Basidia not closely clustered.
Spores subglobose or ellipsoid. *Sistotrema muscicola*.
- Resupinate, even or at most granular-papillate, lacking spines. Basidia closely clustered.
Spores ellipsoid to subcylindric. Bulbils, swollen cells (chlamydospores) or oidia
often present in culture. *Sistotrema brinkmanni*.

Genus 2. *Porotheleum* (Fr. ex Fr.) Fries, Syst. Orb. Veg. (1825) 80.

Fructifications composed of sessile, closely aggregated and confluent cupules, partly immersed in a membranous stromatic subiculum. Hymenium smooth, lining the interior of the cupules. Spores hyaline. Hyphae monomitic, hyaline, with clamps.

A single South African species, *Porotheleum incanum*.

Genus 3. *Cytidia* Quelet, Fl. Myc. de Fr. (1888) 25.

Hymenophores cupulate, sessile, centrally attached, coriaceous to fleshy-gelatinous, discrete, gregarious or confluent, sometimes effused. Hymenium lining the interior of the cupules, smooth, sometimes becoming wrinkled or veined. Spores hyaline or lightly coloured, amyloid. Hyphae usually gelatinised, with clamps, monomitic. Paraphysoids or cystidia present or absent.

1. Spores large, ovate or broad elliptical, at first hyaline, later pale coloured with the wall thickening to $2.5\ \mu$ and penetrated by peg-like projections of the lumen. Fusoid, encrusted cystidia present. *Cytidia habgallae*.
- Spores otherwise; Cystidia absent. 2.
2. Spores of one kind only, cylindrical to allantoid, $1.5-3 \times 7-10\ \mu$. Cupular hairs long and floccose. *Cytidia flocculenta*.
- Spores of two kinds (a) cylindrical or allantoid, $2-2.5-(3.2) \times 6.4-9.6-(11.2)\ \mu$,
(b) ovate to elliptic-depressed, $4.8-6.4 \times 9.6-12.8\ \mu$. Cupular hairs short and scanty. *Cytidia simulans*.

Genus 4. *Solenia* Pers. ex Fr., Syst. Myc. 2 (1823) 200; Persoon in Roemer Neues Mag. Bot. 1 (1794) 116, Syn. Fung. (1801) 675, Myc. Eur. 1 (1822) 334.

***Cyphella* Fries, Syst. Myc. 2 (1823) 201.**

Pilei cupulate, tubular or discoid, discrete or gregarious, sometimes confluent, sessile or stipitate, naked or covered with hyaline or coloured hairs, seated sometimes upon a hyphal subiculum. Hymenium smooth, lining the concave interior of the cupules. Spores hyaline or coloured. Hyphae monomitic, hyaline or coloured, with clamp connections.

Cyphella is an untenable name. The old basis of separating these genera on the presence or absence of the subiculum and the discreteness of the basidiocarps cannot stand; these characters vary in a single collection. For species see the following combined key for both genera.

1. Fructifications cupular to tubular, sessile or shortly stalked. 2.
Fructifications discoid with reflexed margin (i.e. patelliform). Encrusted villose hairs on reflexed part. Spores cylindrical, straight or curved, $3.2-4.8 \times (6.4)-8-11\ \mu$ *Cyphella applanata*.
2. Fructifications villose, with long hairs on the exterior. 3.
Fructifications pruinose with short, sparse hairs or mineral encrustations, or nude, or with hairs mostly appressed. 4.

3. Spores smooth, broad ovate to pip-shaped, $11.2-14.4 \times 9-9.6$ (11.6) μ . Cupules 1-3 mm diam. *Cyphella alboviolascens*.
 Spores finely asperulate, ovoid, $12-15 \times 7-8 \mu$. Cupules 1 mm diam., later becoming flattened. *Cyphella cheesmani*.
4. Hairs appressed, spirally twisted in the outer half. Cupules tubular, adnate in sheaves. Spores $3-4 \times 2.5-3.5 \mu$ *Solenia natalensis*.
 Hairs, if present, not spirally twisted. 5.
5. Spores hyaline. 6.
 Spores lightly coloured. 7.
6. Spores ovate to subglobose, $4.8-6.4 \mu$ diam., smooth or minutely punctate. Cupules $0.3-1.5$ mm diam., not hairy, pruinose with mineral deposits, greyish-white. *Cyphella farinacea*.
 Spores ovate, smooth, somewhat flattened on one side, $3-4 \times 2.5-3.5 \mu$. Cupules up to 0.5 mm diam., creamy yellow, with solid, parallel, appressed surface hairs. *Solenia rhoisa*.
 Spores subglobose to broad ovate, smooth, $3-4 \times 2.5-3 \mu$. Cupules 130μ diam., 250μ long, yellowish when dry, lacking surface hairs. *Solenia minima*.
7. Cupules up to 1 mm high, lacking a subiculum. Hyphae thick-walled, $3-4.8$ (6.4) μ wide. *Cyphella pelargonii*.
 Cupules up to 600μ high, commonly seated on a reddish-brown hyphal subiculum which may be scanty or absent. Hyphae thin-walled, $1.6-2.4 \mu$ wide. *Cyphella variolosa*.

Genus 5. Punctularia Patouillard apud Pat. & Lagerh. in Bull. Herb. Boiss. 3 (1895) 57, pl. 2, Figs. 1, a-g.

Hymenophore resupinate, rarely narrowly reflexed, or dimidiate, subgelatinous, drying ceraceous to corneous. Hymenium covering discoid to elongated, hemispherical pulvinae seated upon a common foundation tissue and separated by sterile fissures containing mineral matter. Basidiospores hyaline to pale coloured, smooth. Dark dendrophyses present in hymenium. Hyphae subgelatinous, hyaline, with clamps. Abhymenial hairs dark brown, with clamps. Gloeocystidia present or absent. Conidial stage often present; conidia coloured, sculptured, formed in an acropetal chain separated by narrower, clamped, portions. Hymenial tissues cemented together by brownish granular material.

1. Mostly resupinate or only narrowly reflexed, usually associated with a prolific conidial state. Hymenium containing dark dendrophyses composed of a hyaline stem and an irregularly swollen, shortly branched, coloured apical part up to 5.4μ wide. Gloeocystidia absent. *Punctularia tuberculosa*.
 Resupinate-reflexed to dimidiate, lacking any known conidial state. Hymenium containing yellow, irregularly branched dendrophyses $1-2 \mu$ wide, whose ultimate branches are thread-like. Yellow gloeocystidia present, $3.5-5 \mu$ wide. *Punctularia strigosozonata*.

Genus 6. Merulius Haller ex Fries, Syst. Myc. 1 (1821) 326.

Fructifications resupinate, effuso-reflexed or pileate, fleshy-gelatinous, coriaceous or membranous. Hymenium at first plane then gyrose-plicate, porose-reticulate, or sometimes dentate or raduloid, fertile on the edges of the folds or teeth. Hyphae monomitic or dimitic, coloured or hyaline, with or without clamp connections. Spores hyaline or coloured, smooth.

1. Hymenium pale to pinkish or orange. 2.
 Hymenium dark, some shade of yellow or brown. 3.
2. Spores oblong-ellipsoid, hyaline to pale yellow, $5-6 \times 3.4-5 \mu$. Hyphae abundantly clamped. *Merulius molluscus*.
 Spores subcylindrical, $2.5-3.5 \times 6-7.5 \mu$, hyaline. Hyphae lacking clamps. *Merulius corium*.
3. All hyphae thin-walled, hyaline or coloured. 4.
 Some hyphae thick-walled and coloured, lacking clamps; others hyaline with thin or slightly thickened walls, with occasional clamps. Hymenium ferruginous-yellow then darker. *Merulius lacrymans*.

4. Hymenium more or less smooth and Dresden Brown colour when dry, changing rapidly to warm russet and becoming convoluted when moistened. Basal hyphae often granule-encrusted. Young parts lacking a lilaceous tint. *Merulius gelatinosus*.
 Hymenium convoluted when dry, umber to warm Brussels Brown or darker. No marked colour change when wetted. Young parts often with a pale lilaceous tint. Basal hyphae not granule-encrusted. *Merulius himantoides*.

Genus 7. Coniophora DC. ex Pers., Myc. Eur. 1 (1822) 153; De Candolle Fl. Fr. 6 (1815) 34.

Coniophorella Karsten, Finl. Basidsv. (1889) 438.

Fructifications resupinate, pellicular, fleshy or membranous. Hymenium smooth or somewhat tubercular, usually some shade of yellow or brown. Spores coloured yellowish to brown, smooth. Hyphae hyaline or coloured, with or without clamp connections, forming mono- or dimitic systems. Septate cystidia sometimes present.

1. Coloured, septate, encrusted cystidia present. Spores $(5)-6-7-(8) \times (10)-12-(14) \mu$
Coniophora olivacea.
 Cystidia absent. 2.
2. Basal hyphae not encrusted, narrow ($\pm 2 \mu$), dark-coloured, the remaining hyphae lightly coloured or hyaline. Hymenium papillate, dark drab colour. Spores $4-6 \times 7.5-10 \mu$ *Coniophora papillosa*.
 Basal hyphae not dark, or if slightly so then $3-(6) \mu$ wide, forming a soft spongy abhy-menial surface. 3.
3. Basal hyphae thickly encrusted with minerals, hyaline to pale coloured, inflated then collapsing. Hymenium light brown to warm sepia or bister. Spores $(5.6)-6.6-(8) \times (8.8)-9.6-11 \mu$ *Coniophora incrustata*.
 Basal hyphae not encrusted, not inflating then collapsing. 4.
4. Fructification fleshy-membranous, easily separable from the substratum. Hymenium tubercular. 5.
 Fructification floccose then pellicular-membranous, arid, not readily separable. Hymenium smooth. Spores $10-13 \times 6-7 \mu$. Hyphae pale coloured or hyaline, the marginal ones with whorled clamps. *Coniophora arida*.
5. [Spores $(5.3)-6.5-8 \times 9-12-14.7 \mu$. Basal hyphae not specially dark. *Coniophora puteana*].
 Spores $5-6-6.6 \times 6.6-7.5-8.3-10 \mu$. Basal hyphae dark, forming a spongy layer, the rest of the hyphae hyaline. *Coniophora fodinarum*.

Genus 8. Tomentella Patouillard, Hym. d'Eur. (1887) 154.

Hypochnus Fries, Syst. Myc. 3 (1829) 289 emend Karsten, Rev. Myc. 3 (1881) 23.

Fructifications resupinate, soft, floccose to membranous, or adnate and crustose. Hyphae laxly intertexted, hyaline to coloured, monomitic, with clamps. Hymenium smooth or papillate. Spores coloured, verrucose, asperulate, angular.

A single species, *Tomentella punicea*, recorded from South Africa.

Genus 9. Thelephora Erhart ex Fries, Syst. Myc. 1 (1821) 428, pr. parte; Erhart, Crypt. Exsicc. No. 178 (1785).

Fructifications effuso-reflexed and encrusting to dimidiate, imbricate, confluent, sessile or shortly stipitate, sometimes the pileus divided into somewhat clavarioid branches, membranous to soft coriaceous. Hymenium inferior, or amphigenous in parts, smooth or somewhat papillate. Spores coloured, echinulate or verrucose, angular. Hyphae monomitic, with clamp connections, mostly dark coloured.

1. Fructifications effused, encrusting, resupinate then emitting oblique or suberect flabellate fascicles of penicillate branches, especially at the margin. Spores $4.8-7.2 \times 6.4-9.6 \mu$ "*Thelephora penicillata*" Lloyd.
 Fructifications effuso-reflexed, or dimidiate, imbricate, confluent, sessile or shortly stipitate. Surface usually strigose. Spores $7-8 \times (7)-9-11 \mu$ *Thelephora terrestris*.

Genus 10. *Hymenochaete* Léveillé, Ann. Sci. Nat. ser. iii, 5 (1846) 150.

Fructifications resupinate, reflexed or pileate, usually sessile, rarely stipitate, annual or perennial, arid-crustose to coriaceous. Hymenium smooth, penetrated by setae. Hyphae coloured, darkening in colour on application of alkali, dimitic or monomitic, lacking clamp connections. Spores hyaline, smooth.

1. Setae found throughout the tissues and commonly arranged in fascicles. Fructification resupinate. *Hymenochaete fasciculata*.
Setigerous layer(s) differentiated from hyphal layer(s). Setae not fasciculate. Fructifications resupinate or dimidiate. 2.
2. Setae rather scanty, confined to the hymenium. 3.
Setae abundant, forming a thick setigerous layer above the rest of the hyphal layers. 4.
3. Setae $35-50 \times 4-6 \mu$. Hymenium Buckthorn Brown to tawny olive (Ridgway).
Tomentum thin. Compact zone differentiated at the base of the trama. Dimidiate
Hymenochaete luteobadia.
Setae $(20)-35-40 \times (6)-8-10 \mu$. Hymenium near Mummy Brown (Ridgway). Tomentum thick. No compact basal zone differentiated. Dimidiate. *Hymenochaete nigricans*.
4. Resupinate. Setigerous layer(s) $\pm 260 \mu$ thick, sometimes arranged in strata. Setae $45-70 \times 5-6-8-4 \mu$. Hyphae moniliform in parts. *Hymenochaete semistupposa*.
Usually effuso-reflexed to dimidiate and imbricate, sometimes resupinate. Setigerous layer $\pm 160 \mu$ thick. Setae $30-45 \times 6-8 \mu$. Hyphae not at all moniliform. Margin conspicuous ochre colour. Abhymenial surface soft, rubbing ochraceous. *Hymenochaete ochromarginata*.

Genus 11. *Duportella* Patouillard in Philippine Journ. Sci. 10 (1915) 87.

Fructifications resupinate, brown. Hymenium velutinate at first, later becoming tubercular and cracked. Pseudosetae (modified ends of skeletal hyphae) present. Gloeocystidia and cystidia present at some stage of development, sometimes not seen. Hyphae dimitic, almost hyaline to brown, with clamps, not forming a notably differentiated basal layer. Spores hyaline, ellipsoid to subcylindric-curved, smooth.

A single South African species, *Duportella tristicula*. But *Stereum fulvum*, which differs in having no gloeocystidia or cystidia, is possibly congeneric and should be compared.

Genus 12. *Stereum* Persoon ex S. F. Gray, A Natural Arrangement of British Plants 1 (1821) 652; Persoon in Roemer Neues Mag. Bot. 1 (1794) 110, Obs. Myc. 1 (1796) 35.

Fructifications coriaceous, membranous or subligneous, sessile, stipitate, effuso-reflexed or resupinate, or dimidiate, or infundibuliform, simple or branched. Stipe lateral, central or absent. Hymenium inferior, smooth, sometimes rugose or exceptionally tubercular. Context with an intermediate layer of \pm horizontally arranged hyphae. Spores hyaline, smooth. Cystidia, gloeocystidia or vesicles present or absent. Annual or perennial, lignicolous or terrestrial. Hyphae monomitic or dimitic, usually hyaline, with or without clamps.

1. Pilei infundibuliform and centrally stipitate. 2.
Pilei not infundibuliform nor centrally stipitate. 7.
2. With gloeocystidia (some may be interpreted as smooth cystidia). 3.
Without gloeocystidia. Here may be located some rare forms of *Stereum lobatum* which are infundibuliform by fusion and thus often partially split down one side.
3. Without surface hairs. Sections do not show any well-marked, denser coloured zone beneath the abhymenial surface. 4.
With (scanty) surface hairs. Sections show a well-marked denser coloured zone beneath the abhymenial surface. Here are located some unusual forms of *Stereum affine* which are only infundibuliform by fusion and are often split down one side.

4. Spores small, ovate, broad-elliptic or subglobose, not larger than $3.4 \times 4.5 \mu$ 5.
 Spores larger, in the range of 3.6×6.5 – 9μ 6.
5. Gloeocystidia up to $12.8 \times 144 \mu$ in size..... *Stereum ravenelii*.
 Gloeocystidia smaller, up to $10.5 \times 80 \mu$ *Stereum nitidulum*.
6. Gloeocystidia usually rather narrow (3.2 – 9.6μ wide) and often hyphoid. Hyphae of two types, some with clamp connections..... *Stereum thozetii*.
 Gloeocystidia usually wider (8 – 9.6 – 16μ wide) and clavate. Hyphae of only one type and without clamps..... *Stereum diaphanum*.
7. Pilei laterally stipitate, or flabellate or spatulate, or sessile and cuneate attached by a markedly reduced base..... 8.
 Pilei dimidiate or effuso-reflexed or resupinate..... 13.
8. Fresh pilei bleeding red when bruised. Conducting vessels present in fresh and dried plants, seen microscopically..... *Stereum australe*.
 Fresh pilei not bleeding. Conducting vessels absent..... 9.
9. Without gloeocystidia or cystidia..... 10.
 With gloeocystidia or cystidia, or both together..... 11.
10. Pilei small (up to 1 cm in any direction) soft, whitish, without colour zones on the surface. Spores pip-shaped or later distorted and angled. Hyphae monomitic. . . *Stereum cyphelloides*.
 Pilei large, coriaceous or tough, surface coloured with zones of grey, brown, chestnut. Spores cylindric-depressed. Hyphae dimitic..... *Stereum lobatum*.
11. With gloeocystidia but no cystidia; Pilei with a definite stipe, flabellate, spatulate or infundibuliform..... *Stereum affine*.
 With both gloeocystidia and cystidia..... 12.
12. Pilei usually merismatoid, i.e. a compound fructification consisting of a number of smaller pilei growing together in a bush. Gloeocystidia 7 – 10×40 – 66μ . . . *Stereum involutum*.
 Pilei not merismatoid, but single or sometimes dimidiate or fused laterally. Gloeocystidia smaller, 7 – $12 \times (15)$ – 25 – $(40) \mu$. Here is located the species represented by *Stereum bellum* and *Stereum friesii* in the sense used by van der Byl.
13. Without cystidia, cystidioles, gloeocystidia, vesicles or conducting organs (distinguish carefully between skeletal hyphae which intrude into the hymenium and conductors or cystidia)..... 14.
 With any of the following organs: cystidia, cystidioles, gloeocystidia, vesicles or conducting vessels (avoid locating here species which have intrusive skeletal hyphae unless these are much swollen like cystidia at the apex)..... 18.
14. Mature pilei small (1 cm or less) soft, whitish, azonate. Spores pip-shaped becoming angularly distorted. Hyphae monomitic..... *Stereum cyphelloides*.
 Mature pilei larger, or if immature then either not whitish or possessing more than one type of hypha..... 15.
15. Skeletal hyphae in context brown. The skeletal hyphae which curve up into the hymenium are brown, rugose or encrusted. Hymenium usually dark-coloured, only rarely yellowish or light coloured. (Compare also *Stereum umbrinum* where the skeletal hyphae are much expanded and resemble cystidia in the hymenium). . . *Stereum fulvum*.
 Skeletal hyphae in context not brown, but hyaline or at most only pale straw-coloured. Hymenium not dark, usually creamy, yellow, orange, fawn or sometimes changing to cinereous..... 16.
16. Pileus with multicoloured zones on the surface, usually flabellate, or if a uniform brown colour then the pilei are relatively large and flabellate..... *Stereum lobatum*.
 Pileus without multicoloured zones on the surface, or zoned in shades of brown; usually smaller than *S. lobatum* and effuso-reflexed or dimidiate, not flabellate..... 17.
17. Pileus thin, coriaceous, effuso-reflexed or dimidiate with a shortly villose or matted hairy surface..... *Stereum hirsutum*.
 Pileus thicker, usually more than 1 mm thick, corky or subligneous, effuso-reflexed, with a thick padlike tomentum of ochraceous to golden hairs..... *Stereum durbanense*.

18. Fresh pilei bleeding red when bruised. Fresh or dried specimens possessing conductors in the hymenium..... 19.
Fresh pilei not bleeding; lacking conductors..... 21.
19. Pilei generally dimidiate or cuneate with a reduced base, rarely widely effuso-reflexed. Hyphae dimitic. Hymenium cinereous, smooth..... *Stereum australe*.
Pilei mostly resupinate-reflexed, rarely dimidiate..... 20.
20. Hymenium rimose, i.e. blistered and cracking into small rough areas, yellow, tan or cinereous. Not on conifers. Hyphae dimitic. Usually more than 700 μ thick
Stereum rimosum var *africanum*.
Hymenium smooth, not rimose, cinereous to light brown. Occurring on conifers.
Hyphae monomitic. Usually less than 600 μ thick..... *Stereum sanguinolentum*.
21. Species possessing pyriform or subglobose vesicles embedded deep in the trama (some of the vesicles are sometimes elongated and must be differentiated from gloeocystidia)..... 22.
Species without vesicles..... 23.
22. Fructifications more or less resupinate, sometimes narrowly reflexed, stratose with a veined or marbled subligneous context and a glabrous black abhymenial surface showing as a black line in wholly resupinate specimens. Hymenium yellowish
Stereum murrayi.
Fructifications effuso-reflexed or dimidiate, not stratose or veined, with a hairy brownish surface. Hymenium purple to purple-brown..... *Stereum purpureum*.
23. Species with cystidia but lacking gloeocystidia..... 24.
Species with gloeocystidia and sometimes cystidia as well..... 25.
24. Cystidia large (12–24 μ wide) conical or fusoid, encrusted, hyaline or only dilutely coloured. Spores averaging $6 \times 11 \mu$. Hymenium light coloured..... *Stereum cinerascens*.
Cystidia dark yellow-brown, subhyaline where emergent, actually only apically swollen and encrusted or rugose skeletal hyphae (rarely smooth at apex). Spores $3-4 \times 6-8 \mu$. Hymenium usually umber-brown or purplish, rarely a light sandy brown. (Compare *Stereum fulvum*, whose skeletal hyphae in the hymenium are less like cystidia, being not much expanded and roughly cylindrical)..... *Stereum umbrinum*.
25. Species with gloeocystidia but no cystidia..... 26.
Species with both gloeocystidia and cystidia..... 27.
26. Context pale creamy to pale yellow-brown, usually stratose. Spores subglobose, 6–7 μ diam. (Gloeocystidia sometimes seen with difficulty). Hyphae dichophytic (See under *Asterostromella duriuscula*)..... *Stereum duriusculum*.
Context brown contrasting with a hyaline hymenial layer. Spores $3-4.5 \times 2-3 \mu$. Gloeocystidia abundant, sometimes fragmented and refractile like cystidia. Hyphae capillary, normal..... *Stereum bicolor*.
27. Cystidia and gloeocystidia clearly differentiated. Context pale coloured throughout. Hyphae hyaline. Here may be located the species represented by *Stereum bellum* and *Stereum friesii* in the sense of van der Byl.
Only gloeocystidia present, the older ones fragmented and highly refractile thus resembling cystidia or mineral aggregations. Context brown, contrasting with a hyaline hymenial layer. Basal hyphae mostly brown..... *Stereum bicolor*.

Genus 13. Cymatoderma Junghuhn in Tijdschr. Nat. Gesch. Phys. ed. v. d. Hoeven & De Vriese 7 (1840) 390.

Cladoderis Pers. ex Berk. in Hooker Lond. Journ. Bot. 1 (1842) 152.

Fructifications coriaceous, flabellate to infundibuliform, sessile, substipitate or stipitate. Surface radially sublamellate with scanty hairs or covered with a thick tomentum. Hymenium radially costate, frequently coarsely papillate. Context with a basal layer of horizontally arranged hyphae and a middle layer of more or less vertical ones. Hyphae dimitic, hyaline, with clamp connections. Spores hyaline, smooth. Gloeocystidia and/or cystidia present.

1. Pileus deeply dissected into narrow radiating segments. Hyphae monomitic. Cystidia and gloeocystidia absent. Basidia with 2-4 sterigmata. Spores $4.8-6.4 \mu$.
(This is a species of *Clavulina* or *Aphelaria*)..... *Cladoderis funalis*.
Pileus entire to shortly lacinate at the margin. Hyphae dimitic. Cystidia and/or gloeocystidia present..... 2.
2. (Gloeocystidia present, cystidia absent. Spores \pm subglobose, $2 \times 4 \mu$ or $3-4 \mu$ diam..... *Cladoderis dendritica*).
Both gloeocystidia and cystidia present. Spores ellipsoid, $3.5 \times 6-10 \mu$... *Cymatoderma elegans*.

Genus 14. *Asterostromella* Höhnelt & Litsch., K. Akad. Wiss. Wien. Sitzungsab. 116 (1907) 773.

Fructifications resupinate, annual or perennial (becoming stratose) coriaceous to subligneous. Hymenium smooth. Hyphae monomitic, hyaline to faintly coloured, with clamp connections, dichophytic to dendrophytic. Context with a basal layer of horizontal hyphae and a middle layer of \pm vertical hyphae. Gloeocystidia present in most species. Spores smooth or minutely stippled, hyaline or faintly coloured, often subglobose.

1. Context white or light yellowish; hyphae dendrophytic, hyaline. Sections not darkening in KOH. Spores $6-6.8 \mu$ diam., subglobose..... *Asterostromella duriuscula* (= *Scytinostroma duriusculum* fide Donk; see p. 160).
Context not light coloured; hyphae dendrophytic, hyaline or very dilutely coloured. Sections darkening slightly in KOH. Spores elliptic-oval, $5.5 \times 8.3 \mu$ *Asterostromella rumpiana*. (Referred to *Scytinostroma* by Donk: p. 160).

Genus 15. *Pellicularia* Cooke in Grevillea 4 (1876) 116 sensu Rogers in Farlowia 1 (1943) 96.

Botryobasidium Donk in Nederl. Myc. Ver. Med. (1931) 116.

Fructifications resupinate, arachnoid, pellicular or loosely membranous. Hymenium discontinuous. Hyphae monomitic, with or without clamp connections, hyaline or dilutely coloured, wide, short-celled, branching at right angles. Basidia in terminal botryose clusters, bearing 4-6-8 sterigmata. Spores smooth or sculptured, hyaline or pale yellowish. Cystidia or septocystidia present or absent. Saprophytic or parasitic.

1. Spores rough-walled, ellipsoid, minutely asperulate. Clamps lacking.... *Pellicularia asperula*.
Spores smooth..... 2.
2. Encrusted septocystidia present. Hyphae encrusted with wartlike granules, about 6μ wide. Spores subglobose to broad ovate-elliptical, $5.7-5 \times 4.5-6 \mu$... *Pellicularia fodinarum*.
No septocystidia present. Hyphae not encrusted. Spores otherwise..... 3.
3. Saprophytic. Spores navicular or asymmetrically fusiform, $9.6-12.8 \times 4.5-6 \mu$.
Hyphae up to 13μ wide..... *Pellicularia vaga*.
Parasitic. Spores ellipsoid, flattened on one side, with a truncate apiculus, $8-12 \times 5-7 \mu$. Hyphae $5-12$ -(17) μ wide..... *Pellicularia filamentosa*.

Genus 16. *Aleurodiscus* Rabenhorst ex Schroeter, Krypt.-Fl. Schlesien 3 (1888) 429.

Fructifications resupinate, or narrowly reflexed, or pileate, discoid, pezizaeform or flabellate, coriaceous. Hymenium smooth, pulverulent. Hyphae hyaline, with or without clamp connections. Basidia usually rather large to very large. Spores hyaline, smooth or echinate. Simple paraphyses, dendrophyses, acanthophyses and gloeocystidia frequently present singly or in combination.

1. Both yellowish gloeocystidia and encrusted dendrophyses present together. Amyloid granules encrusting the dendrophyses. Spores broad elliptic to ovate, $13.5-15 \times 7.5-8 \mu$ *Aleurodiscus botryosus*.
Either gloeocystidia or dendrophyses present, or both absent. Spores otherwise..... 2.

2. Spores semilunate, biapiculate, smooth or minutely echinate, about $14 \times 23 \mu$. Acanthophyses and simple unbranched paraphysoids present. *Aleurodiscus mirabilis*.
Spores otherwise. 3.
3. Fructifications whitish or light coloured but not rosy, purplish, violet, lilac or brownish to clay-coloured. 4.
Fructifications rosy, purplish, violet, lilac or brownish to clay-coloured. 6.
4. Spores ovate-subglobose, $18-22 \times 12.5-16 \mu$. Simple cylindric paraphysoids and gloecystidioid submoniliform paraphysoids present. *Aleurodiscus disciformis*.
Spores not more than 8μ broad. Encrusted dendrophyses and bulbous pseudophyses with a short to long apical outgrowth present. 5.
5. (Spores ovoid, $5.6-6.4 \times 8-12 \mu$, ratio length/width less than 2.0. *Aleurodiscus acerinus*.)
Spores broad elliptic to ovate, $4-8 \times 9-17.6 \mu$, ratio length/width more than 2.0
Aleurodiscus acerinus var *alliaceus*.
6. Fructifications rose-coloured, paling to a fleshy tint on storage. *Aleurodiscus roseus*.
Fructifications purplish, violet, lilac or partly changing to brown or clay-coloured
Aleurodiscus polygonioides.

Genus 17. *Asterostroma* Massee in Journ. Linn. Soc. Bot. 25 (1889) 154.

Fructifications resupinate. Hymenium somewhat pulverulent, smooth. Hyphae hyaline to pale coloured, loosely intertexted, some being modified into asteroetae which are deep brown in colour. Gloecystidia commonly present. Spores hyaline, smooth, or sculptured. Hyphal system monomitic, lacking clamp connections.

A single South African species, *Asterostroma cervicolor*.

Genus 18. *Dendrothele* Höhnelt & Litsch., in K. Akad. Wiss. Wien Sitzungsab. 116 (1907) 819.

Fructifications resupinate or narrowly reflexed, effused or discoid, membranous. Hymenium pulverulent, smooth except for emergent hyphal pegs composed of delicate dendrophytic hyphae which are also present in the hymenium. Hyphae hyaline, with clamp connections. Spores hyaline, smooth.

A single South African species, *Dendrothele duthieae*.

Genus 19. *Peniophora* Cooke in Grevillea 8 (1879) 20.

Fructifications resupinate, usually pellicular to membranous or crustose, occasionally gelatinous-mucoid. Hyphae hyaline, \pm vertically arranged, with or without clamp connections. Spores smooth or rarely minutely punctate under oil immersion, hyaline. Cystidia present, simple or septate, encrusted or smooth. Gloecystidia and/or cystidioles present or absent.

1. Context yellow-buff to isabelline colour, turning strong violet colour immediately on application of KOH solution. *Peniophora filamentosa*.
No violet colour reaction with KOH solution. 2.
2. Texture gelatinous-mucoid, drying to a very thin greyish or bluish vernicose film.
Spores smooth in KOH but minutely punctate in lactic acid under oil immersion lens. 3.
Texture otherwise; spores otherwise. 4.
3. Cystidioles simple or with a capitate apex composed of a few short lobes. Spores $5-6(7) \times 3-4 \mu$ *Peniophora pruinosa*.
Cystidioles simple or with a unbranched inflated capitate apex. Spores $(5.6)-6.4-7-(8.8) \times 8-10-(12) \mu$ *Peniophora rimicola*.
4. Cystidia septate, often with clamp connections at the septa. *Peniophora aspera*.
Cystidia not septate. 5.

5. Cystidia long cylindrical, acicular or subulate, sometimes with a bulbous base, coated with scale-like, flattened granules. Spores $2.2-3.2 \times 6.4-8 \mu$, elliptic-fusoid or somewhat allantoid. *Peniophora longispora* var *brachyspora*.
Cystidia and spores otherwise. 6.
6. Cystidia occupying a relatively narrow zone confined to the hymenium and subhymenium. 7.
Cystidia basal or staged throughout the trama, or at least originating in mid-trama, but not confined to the uppermost layers in a distinct zone. 8.
7. Cystidia in a zone $70-100 \mu$ thick above a byssoid trama of thick-walled hyphae.
Cystidia encrusted, fairly thin-walled, $20-36-(40) \times 10-13 \mu$. *Peniophora pelliculosa*.
Cystidia thick-walled, heavily encrusted, $36-80 \times 10-11.5 \mu$; Tramal hyphae indistinct, not loose and byssoid. *Peniophora gigantea*.
8. Cystidia smooth, thin-walled or thick-walled. 9.
Cystidia encrusted, thick-walled. 10.
9. Cystidia thick-walled, the lumen canalicular below but brusquely dilated at the apex.
Walls of the cystidia soluble in KOH but not in lactic acid. Spores allantoid. *Peniophora gracillima*.
Cystidia thin-walled, gloeocystidioid. Spores oblong or cylindrical or ellipsoid-flattened, $3-5 \times 7-10 \mu$. *Peniophora tenuis*.
10. Hyphae distinct, $3-6 \mu$ wide. Spores $2.5-3 \times 6-8 \mu$. Cystidia $6-10 \times 50-120 \mu$. *Peniophora arenata*.
Hyphae indistinct, agglutinated, 3μ wide. Spores $3 \times 5.5 \mu$. Cystidia $10-16 \times 50-70 \mu$. *Peniophora roumeguerii*.

Genus 20. Corticium Persoon ex Fries, Epicr. Syst. Myc. (1838) 556; Persoon, Myc. Eur. 1 (1822) 128, *pr. parte*.

Fructifications resupinate, effused, pellicular, byssoid, membranous. Hymenium smooth. Hyphae monomitic, hyaline, with or without clamp connections, arranged more or less vertically. Spores smooth (or sculptured), hyaline (or pale coloured). Cystidia absent. Cystidioles, gloeocystidia, simple paraphysoids present or absent. Embedded vesicles or ampoule hyphae present or absent.

1. Species with gloeocystidia. 2.
Species with cystidioles. 6.
Species without gloeocystidia or cystidioles. 7.
2. Gloeocystidia moniliform, originating from tortuous hyphae. Spores cylindrical to ellipsoid, $7.4-10 \times 3.4-8 \mu$. *Corticium moniliforme*.
Gloeocystidia not moniliform. 3.
3. Spores amyloid, minutely roughened under oil immersion, $3.4 \times 4-6-7 \mu$. Gloeocystidia frequently bifurcate at the base (but not always), not turning brown in Iodine solution. *Corticium porosum*.
Spores not amyloid; smooth or finely asperulate. 4.
4. Spores finely asperulate, subglobose to broad elliptical, $4.8 \times 5.6 \mu$ or $4.8-6.4-8 \mu$ diam., often embedded in the context. Texture hypochneid. *Corticium punctulatum*.
Spores smooth. 5.
5. Gloeocystidia numerous, immersed, with bright yellow contents. Spores $4-5 \times 9-11.5 \mu$. *Corticium luteocystidium*.
Gloeocystidia immersed, hyaline, often capped by amber coloured resinous globules; spores $3-4 \times 7-10 \mu$. *Corticium pallidum*.
6. Cystidioles rare, immersed or slightly emergent, hyaline, sometimes with a subapical septum; spores pip-shaped, usually agglutinated, $3-4 \times 5.5-6.5 \mu$. *Corticium gloeosporum*.
7. Fungus bright blue colour throughout. *Corticium caeruleum*.
Fungus not at all blue. 8.

8. Basal hyphae thick-walled, very distinct, $6-11.5 \mu$ wide. Spores $6.5-8.3 \times 10-13 \mu$. Hymenium rosy, paling to flesh colour, smooth or cracked into areoles connected by whitish subiculum. *Corticium salmonicolor*.
Basal hyphae less than 5μ wide, may be indistinct. 9.
9. Spores large, in the range of $10-16 \times 6-8 \mu$ 10.
Spores smaller, in the range of $4.5-9 \times 3-5 \mu$ 11.
10. Hymenium waxy, smooth, apricot to cinnamon-buff colour. Spores $6-6.7 \times 10-16 \mu$ *Corticium armeniacum*.
Hymenium waxy, whitish, like candle grease when fresh, smooth, seldom cracked, drying buff to light pinkish-buff. Spores oblong-subsppherical, $7-8 \times 10-11.5 \mu$, with prominent apiculi. *Corticium confluens*.
11. Hymenium cracking into flaky areoles with whitish subiculum, dirty white to light tan colour. Spores $5-7(9) \times 3.5-5 \mu$ *Corticium scutellare*.
Hymenium tuberculate, reddish-ochre with liver-brown tubercles and pale margin. Context dingy yellow. Spores $3-4.2 \times 4.5-5.5 \mu$ *Corticium tumulosum*.

SPECIES INDEX OF RECORDED SOUTH AFRICAN THELEPHORACEAE.

In the Index presented below, all the species of the Thelephoraceae that have been recorded for South Africa are listed alphabetically under their specific epithets, followed by the genus and author citations. Names printed in capitals are of species accepted as occurring in South Africa; those printed in small letters are rejected as not occurring here, or as synonyms, or as dubious records which can neither be confirmed nor denied.

Following each name there is a reference to the paper or papers in *Bothalia* in which the writer has described, discussed or annotated the species, each paper being cited by the volume and page number of this journal. In the case of rejected or dubious species a brief reason is given for their disposal as such.

abeuns, *Corticium* Burt: 6, p. 19; 7, p. 143.

Specimen not *C. abeuns*, but instead is *Corticium porosum*.

acerina, *Thelephora* (Pers.) Pers. ex Fr.: 6, p. 62; 7, p. 123.

= *Aleurodiscus acerinus* or its variety *alliaceus*.

acerinum, *Stereum* (Pers. ex Fr.) Fr.: 7, p. 123.

= *Aleurodiscus acerinus* or its variety *alliaceus*.

acerinus, *Aleurodiscus* (Pers. ex Fr.) Höhnelt & Litsch.: 6, pp. 26, 28, 466. No material traced.

ACERINUS var ALLIACEUS, ALEURODISCUS (Quel.) Bourd. & Galz.: 6, pp. 26, 466.

acerinus var longisporus, *Aleurodiscus* Höhnelt & Litsch.: 6, pp. 26, 467.

= *Aleurodiscus acerinus* var *alliaceus*.

adnatum, *Stereum* Lloyd: 6, pp. 39, 45, 304.

= *Stereum rimosum* var *africanum*.

AFFINE, *STEREUM* Lév.: 6, p. 304.

affinis, *Punctularia* (B. & C.) Talbot: 6, p. 25; 7, p. 140.

= *Punctularia tuberculosa*.

africana, *Sebacina* Burt: 7, p. 152.

Type is referable to *Peniophora tenuis* group.

albobadium, *Stereum* (Schw. ex Fr.) Fr.: 6, pp. 45, 305.

Material not this species.

ALBOVIOLASCENS, CYPHELLA (Alb. & Schw. ex Fr.) Karst.: 6, p. 471.

amoenum, *Stereum* Kalchbr. & MacOwan: 6, p. 305.

= *Stereum kalchbrenneri*; = *Stereum hirsutum*.

APPLANATA, CYPHELLA Talbot: 6, p. 472.

ARENATA, PENIOPHORA Talbot: 4, p. 944; 6, p. 22.

argillaceum, *Corticium* Höhnelt & Litsch.: 6, p. 13.

nomen nudum; = *Corticium pallidum*.

ARIDA, CONIOPHORA (Fr.) Karst.: 7, p. 138.

- ARMENIACUM, CORTICIUM Sacc.: 6, p. 16.
 ASPERA, PENIOPHORA (Pers.) Sacc.: 6, p. 21.
 ASPERULA, PELLICULARIA Rogers: 7, pp. 137.
 atrocinerea, Coniophora (Karst.) Karst.: 7, p. 138.
 = *Coniophora olivacea*.
 atrocinerea, Coniophorella Karst.: 6, p. 35.
 = *Coniophora olivacea*.
 atrocinerea, Peniophora Massee: 6, pp. 43, 44.
 = *Stereum fulvum*.
 atrocinereum, Corticium Kalchbr.: 6, pp. 19, 44.
 nomen nudum; = *Stereum fulvum*.
 atrocinereum, Stereum (Massee) van der Byl: 6, pp. 43–45, 306.
 = *Stereum fulvum*.
 AUSTRALE, STEREUM Lloyd: 6, p. 306.
 australica, Cladoderris Berk. ex Sacc.: 7, p. 121.
 = *Cymatoderma elegans*.
 australis Kalchbr. f. minima Bres., Cladoderris: 7, p. 120.
 The material is *Stereum thozetii*.
 bellum, Stereum (Kunze) Sacc.: 6, p. 307.
 Doubtful as to species. The species is the same as van der Byl's material of "*Stereum friesii*".
 betulae, Coniophora (Schum.) Karst.: 6, p. 36; 7, p. 138.
 The specimen is the type of *Coniophora incrustata*.
 BICOLOR, STEREUM (Pers. ex Fr.) Fr.: 6, pp. 39, 308.
 [Syn. *Laxitextum bicolor* (Pers. ex Fr.) Lentz: 7, p. 160].
 biennis, Thelephora Fr.: 6, pp. 62, 309, 316; 7, p. 123.
 MacOwan's specimens are *Stereum bicolor*.
 bombycinum, Corticium (Sommerf.) Bres.: 6, p. 19; 7, p. 143.
 The specimen is *Peniophora arenata*.
 BOTRYOSUS, ALEURODISCUS Burt: 6, p. 467.
 bresadoleanum, Stereum Lloyd: 6, p. 309.
 = *Stereum involutum*.
 BRINKMANNI, SISTOTREMA (Bres.) J. Eriksson: 7, p. 159.
 CAERULEUM, CORTICIUM (Schrad. ex Pers.) Fr.: 6, p. 15.
 calceum, Corticium Fr. sensu Romell & Burt: 6, pp. 19, 27.
 nomen confusum.
 calceum Fr. var lacteum Fr., Corticium: 6, pp. 19, 27.
 nomen confusum; MacOwan's material is the type of *Aleurodiscus acerinus* var *longisporus*.
 calix, Thelephora Kze.: 7, p. 121.
 Specimen corresponds with *Cymatoderma elegans*.
 candida, Solenia Pers.: 6, p. 480.
 Material is the type of *Solenia natalensis*.
 capensis, Aleurocystus Lloyd ex Stevenson & Cash: 6, p. 465.
 nomen provisorium; = *Cytidia habgallae*.
 capensis, Aleurodiscus Lloyd: 6, p. 468.
 = *Cytidia habgallae*.
 capensis, Gloeosoma Lloyd (as 'McGinty'): 6, p. 479.
 nomen provisorium; = *Cytidia habgallae*.
 caperatum, Stereum Lloyd: 6, pp. 309, 340.
 = *Stereum turgidum*; = *Stereum cinerascens*.
 carnosae, Peniophora Burt: 7, p. 147.
 Material is *Peniophora roumeguerii*.
 ceraceum, Corticium Berk. & Ravenel ex Massee: 6, pp. 16, 19.
 nomen nudum; = *Corticium armeniacum*.
 cerebella, Coniophora Pers.: 7, p. 139.
 = *Coniophora puteana*, but the South African specimens are not that.
 cerussatus, Aleurodiscus (Bres.) Höhnelt & Litsch.: 6, pp. 28, 468.
 Material is *Aleurodiscus botryosus*.

- CERVICOLOR, ASTEROSTROMA (B. & C.) Massee: 6, p. 54.
- CHEESMANNI, CYPHELLA Massee: 6, p. 472.
- CINERASCENS, STEREUM (Schw.) Massee: 6, pp. 40, 309, 339–346.
(= *Lopharia cinerascens* fide Cunningham: 7, p. 160.)
- cinerea, Peniophora (Fr.) Cooke: 6, p. 24; 7, p. 147.
Doubtful. Some specimens are *Stereum umbrinum*, some *Hymenochaete* spp., while others may be *Peniophora cinerea* in an immature condition.
- cinereum, Corticium Pers. ex Fr.: 6, p. 19.
= *Peniophora cinerea*.
- cinereum, Stereum Lév.: 6, p. 310.
Doubtful. Material not traced.
- concolor, Stereum Jungh.: 6, p. 310.
= *Stereum lobatum* (= *Stereum ostrea* fide Lentz: 7, p. 160.).
- CONFLUENS, CORTICIUM (Fr.) Fr.: 6, p. 18.
- confluens, Merulius Schw.: 6, pp. 30, 33; 7, p. 152.
Specimens not distinguished from *Merulius corium*.
- CORIUM, MERULIUS (Pers. ex Fr.) Fr.: 6, p. 30.
- cornea, Cytidia Lloyd: 6, p. 476.
= *Cytidia habgallae*.
- corneus, Aleurodiscus Lloyd: 6, p. 468.
= *Cytidia habgallae*.
- CORNUCOPIOIDES, CRATERELLUS (Linn. ex Fr.) Pers.: 7, p. 117.
- cremea, Peniophora Bres.: 6, p. 25; 7, p. 147.
Specimens are *Peniophora pelliculosa* and *Corticium gloeosporum*.
- curreyi, Cyphella B. & Br.: 6, p. 472.
= *Cyphella alboviolascens*.
- CYPHELLOIDES, STEREUM B. & C.: 6, p. 311.
- decretus, Necator Massee: 6, p. 18; 7, p. 144.
Conidial stage of *Corticium salmonicolor*.
- dendritica, Thelephora Fr.: 7, p. 121.
South African specimen corresponds with *Cymatoderma elegans*.
- DIAPHANUM, STEREUM (Schw.) Cooke ex Sacc.: 6, p. 311.
[Syn. *Cotylidia diaphana* (Schw.) Lentz: 7, p. 160.].
- DISCIFORMIS, ALEURODISCUS (DC. ex Fr.) Pat.: 6, pp. 28, 468.
- dregeana, Hymenochaete (Berk.) Massee: 6, pp. 57, 344; 7, p. 155, 159.
= *Irpex dregeanus*.
- dregeana, Lopharia (Berk.) Talbot: 6, pp. 57, 344.
= *Irpex dregeanus*.
- dregeanum, Corticium Berk.: 6, pp. 19, 57, 344.
= *Irpex dregeanus*.
- DREGEANUS, IRPEX (Berk.) Talbot: 6, p. 344; 7, p. 159.
- DURBANENSE, STEREUM van der Byl: 6, p. 312.
- DURIUSCULA, ASTEROSTROMELLA (B. & Br.) Talbot: 6, p. 51.
[Syn. *Scytinostroma duriusculum* (B. & Br.) Donk: 7, p. 160.].
- duriusculum, Stereum Berk. & Br.: 6, pp. 45, 51, 313.
= *Asterostromella duriuscula* (B. & Br.) Talbot.
- DUTHIEAE, DENDROTHELE Talbot: 6, p. 478.
- ELEGANS, CYMATODERMA Jungh.: 7, p. 120.
- elegans, Stereum Mey.: 6, pp. 45, 313.
Some material is *Stereum thozetii*, other is *Stereum nitidulum*.
- eylesii, Hypochnus van der Byl: 6, p. 63; 7, pp. 146, 155.
Isotype is *Corticium punctulatum*.
- eylesii, Tomentella (v. d. Byl): 6, p. 63; 7, pp. 155.
Isotype is *Corticium punctulatum*.
- FARINACEA, CYPHELLA Kalchbr. & Cooke: 6, p. 472.
- fasciatum, Stereum (Schw.) Fr.: 6, p. 314.
Doubtful. Most specimens appear to be *Stereum lobatum*
(= *Stereum ostrea* fide Lentz: 7, p. 160.).

- FASCICULATA, HYMENOGHAETE Talbot: 4, p. 943; 6, p. 48.
- FILAMENTOSA, PELLICULARIA (Pat.) Rogers: 7, p. 136.
[Syn. *Thanatephorus cucumeris* (Frank) Donk.: 7, p. 134.].
- FILAMENTOSA, PENIOPHORA (B. & C.) Burt.: 6, p. 23.
- FLOCCULENTA, CYTIDIA (Fr.) Höhnelt & Litsch.: 6, p. 476.
- FODINARUM, CONIOPHORA Talbot: 6, pp. 34, 36, 64.
- FODINARUM, PELLICULARIA Talbot & Green: 7, p. 135.
- friesii, Cyphella Quel.: 6, pp. 473, 476.
Material too poor for determination.
- friesii, Stereum Lév.: 6, p. 314.
Doubtful. Van der Byl's material under *Stereum bellum* is the same species.
- fulva, Hymenochaete Burt.: 7, p. 155.
No specimens correspond with this.
- fulva, Thelephora Lév.: 6, p. 315; 7, p. 124.
= *Stereum fulvum*.
- fulvodisca, Cyphella Cooke & Massee: 6, p. 473.
= *Cyphella variolosa*.
- FULVUM, STEREUM (Lév.) Saccardo: 6, p. 315.
- FUNALIS, CLADODERRIS P. Henn.: 7, p. 122.
Accepted as to species but closer to *Clavulina* or *Aphelaria* than to *Cladoderris*.
- fuscoviolascens, Hymenochaete (Mont.) v. d. Byl: 6, p. 50; 7, p. 155.
No specimens in existence.
- fuscoviolascens, Thelephora Mont.: 6, p. 62; 7, p. 155.
= *Hymenochaete fuscoviolascens*.
- fuscum, Stereum (Schröd.) Quel.: 6, pp. 39, 40, 45, 316.
= *Stereum bicolor*.
- GELATINOSUS, MERULIUS Lloyd: 6, p. 32.
- GIGANTEA, PENIOPHORA (Fr.) Massee: 6, p. 24.
- glabrescens, Stereum Berk. & Curt.: 6, p. 316.
Material is *Stereum affine*.
- glebulosa, Peniophora (Bres.) Sacc. & Syd.: 6, p. 25; 7, p. 148.
= *Peniophora gracillima*.
- GLOEOSPORUM, CORTICIUM Talbot: 4, p. 940; 6, p. 14.
- GRACILLIMA, PENIOPHORA Ell. & Everh.: 7, p. 147.
- HABGALLAE, CYTIDIA (B. & Br.) Martin: 6, p. 477.
- HIMANTIOIDES, MERULIUS Fr.: 6, p. 31.
- hirsuta, Thelephora (Willd.) Pers. ex Fr.: 7, p. 124.
= *Stereum hirsutum*.
- HIRSUTUM, STEREUM (Willd.) Pers. ex S. F. Gray: 6, p. 316.
- hirsutum forma kalchbrenneri, Stereum Simpson & Talbot: 6, p. 317.
nomen nudum; = *Stereum hirsutum*.
- INCANUM, POROTHELEUM (Kalchbr.) Sacc.: 6, p. 479.
- incanum, Stigmatolemma Kalchbr.: 6, p. 481.
= *Porothelium incanum*.
- incarnata, Peniophora (Pers. ex Fr.) Karst.: 7, p. 148.
Specimen is close to *P. incarnata* but lacks gloeocystidia and may be undescribed.
- INCRUSTATA, CONIOPHORA Talbot: 7, p. 139.
- infundibuliformis, Cladoderris (Klotzsch) Fr.: 7, p. 123.
= *Cymatoderma elegans*.
- intybacea, Thelephora Pers. ex Fr.: 7, p. 124.
Specimens accepted as *Thelephora terrestris*.
- INVOLUTUM, STEREUM (Klotzsch) Fr.: 6, p. 317; 7, p. 118.
- kalchbrenneri, Stereum Sacc.: 6, p. 319.
= *Stereum hirsutum*.
- laciniata, Thelephora Pers. ex Fr.: 7, p. 124.
= *Thelephora terrestris*.

- lacrymans, Merulius (Wulf. ex Fr.) Fr.: 6, pp. 32, 33; 7, p. 152.
Doubtful. Usually confused with *Merulius himantioides*.
- lacteam, Corticium Fr.: 6, p. 19; 7, p. 143.
nomen dubium; No specimens seen.
- laetum, Corticium (Karst.) Pers.: 7, p. 144.
Specimens are *Corticium salmonicolor*.
- laxum, Stereum Lloyd: 6, pp. 45, 319.
= *Stereum bicolor*.
- lirellosa, Lopharia Kalchbr. & MacOwan: 6, pp. 309, 340.
= *Stereum cinerascens*.
- LOBATUM, STEREUM (Kze. ex Fr.) Fr.: 6, p. 319.
(Syn. *Stereum ostrea* fide Lentz: 7, p. 160).
- lobatum var cinereum, Stereum Lloyd ex Doidge: 6, p. 320.
nomen nudum; = *Stereum australe*.
- LONGISPORA (Pat.) Höhn. var BRACHYSPORA Talbot & Green, PENIOPHORA: 7, p. 148.
- LUTOBADIA, HYMENOCOAETE (Fr.) Höhn. & Litsch.: 6, p. 50; 7, p. 155.
- luteobadium, Stereum Fr.: 6, pp. 45, 320, 323; 7, p. 155.
= *Hymenochaete luteobadia*. But some specimens seen are *Stereum lobatum*.
- LUTEOCYSTIDIATUM, CORTICIUM Talbot: 4, p. 941; 6, p. 13.
- membranaceum, Stereum Fr.: 6, pp. 45, 320.
Material is *Stereum fulvum*.
- MINIMA, SOLENIA Cooke & Phil.: 6, p. 480.
- MIRABILIS, ALEURODISCUS (B. & C.) Höhn. & Litsch.: 6, p. 469.
- mirabilis, Lopharia (B. & Br.) Pat.: 6, pp. 56, 340.
= *Stereum cinerascens*.
- MOLLUSCUS, MERULIUS Fr.: 7, p. 153.
- MONILIFORME, CORTICIUM Talbot: 7, p. 144.
- MURRAI, STEREUM (Berk. & Curt.) Burt: 6, p. 320.
- murrayi, Stereum (B. & C.) Burt: 6, p. 320.
Orthographic variant of *Stereum murrayi*.
- MUSCICOLA, SISTOTREMA (Pers.) Lundell: 7, p. 158.
- natalensis, Femsjonia Cooke: 6, p. 476.
A species of *Cyphella*, but the material is in poor condition.
- NATALENSIS, SOLENIA W. B. Cooke: 6, p. 480.
- NIGRICANS, HYMENOCOAETE (Lév.) Bres.: 7, p. 156.
- nigricans, Stereum Lév.: 7, p. 156.
= *Hymenochaete nigricans*.
- NITIDULUM, STEREUM Berk.: 6, p. 321.
- notatum, Stereum B. & Br.: 6, p. 322.
Dubious. South African material is probably a young *Stereum hirsutum*.
- nuda, Peniophora (Fr.) Bres.: 6, p. 25; 7, p. 149.
Doubtful. No specimens traced.
- nudum, Corticium Fr.: 6, p. 19.
= *Peniophora nuda*.
- ochraceoflavum, Stereum Schw. ex Peck: 6, p. 322.
Specimen is not this species but its true identity is doubtful.
- OCHROMARGINATA, HYMENOCOAETE Talbot: 4, p. 944; 6, p. 49.
- OLIVACEA, CONIOPHORA (Fr.) Karst.: 6, p. 35.
- olivacea, Coniophorella (Fr.) Karst.: 6, p. 35.
= *Coniophora olivacea*.
- OSTREA, STEREUM (Blume & Nees) Fr.: 6, p. 322; 7, p. 160.
No specimens available under this name.
- PALLIDUM, CORTICIUM Bres.: 6, p. 13.
- palmata, Thelephora (Scop.) Fr.: 7, p. 124.
Material indeterminable but certainly not *T. palmata*.
- PAPILLOSA, CONIOPHORA Talbot: 4, p. 939; 6, p. 33.

- papyrina, *Peniophora* (Mont.) Cooke: 7, p. 149.
Doubtful. One specimen is *Stereum fulvum*; one other specimen not seen.
- pedicellata, *Thelephora* Schw.: 6, p. 63; 7, p. 125.
The material is a species of *Septobasidium* but not *S. schweinitzii* with which *T. pedicellata* is synonymous.
- PELARGONII, *CYPHELLA* Kalchbr.: 6, p. 473.
- pellicula, *Hymenochaete* B. & Br.: 6, p. 329.
MacOwan (1055) in Herb. S.A. Mus. No. 34315 is *Stereum umbrinum*.
- pelliculare, *Corticium* Karst.: 6, p. 19; 7, p. 145.
The material is *Peniophora arenata*.
- PELLICULOSA, *PENIOPHORA* Talbot: 6, pp. 20, 63.
- penicillata, *Thelephora* Lloyd: 7, p. 125.
Invalid as a later homonym of *T. penicillata* Fr. The specimens are possibly *Thelephora mollissima*.
- percome, *Stereum* B. & Br. 6, pp. 45, 322.
The material is *Hymenochaete nigricans*.
- perlutum, *Stereum* Berk.: 6, p. 322.
The material is *Stereum lobatum* (= *S. ostrea* fide Lentz: 7, p. 160).
- pinastris, *Merulius* (Fr.) Burt: 7, p. 154.
Specimen deformed and indeterminable but does not correspond microscopically with *M. pinastris*.
- POLYGONIOIDES, *ALEURODISCUS* (Karst.) Pilat: 6, p. 470.
[Syn. *Laeticorticium polygonioides* (Karst.) Donk.: 7, p. 160.].
- POROSUM, *CORTICIUM* Berk. & Curt.: 7, p. 145.
- portentosum, *Corticium* Berk. & Curt.: 6, pp. 19, 52.
South African material is *Asterostromella duriuscula*.
- praetermissum, *Corticium* Karst.
= *Peniophora tenuis*.
- proximum, *Stereum* Lloyd: 6, p. 322.
= *Stereum involutum*.
- pruinata, *Peniophora* (B. & C.) Burt: 7, p. 150.
= *Stereum pruinatum*; but the South African material is different and indeterminable.
- pruinatum, *Stereum* B. & C.: 6, pp. 45, 322; 7, p. 150.
Indeterminable material but not this species.
- PRUINOSA, *PENIOPHORA* (Pat.) Jackson: 7, p. 150.
- pulverulenta, *Coniophora* (Lév.) Massee: 7, pp. 126, 139.
= *Thelephora pulverulenta* Lév., whose type is a species of *Hymenochaete*, probably *H. luteobadia*.
- pulverulentum, *Stereum* Lév.: 6, p. 323; 7, p. 139.
The type specimen is a species of *Hymenochaete*, probably *H. luteobadia*.
- punctiformis, *Cyphella* (Fr.) Karst.: 6, p. 474.
One specimen is a minute agaric. There is no material of the other which was recorded as *C. punctiformis* var *strigosa*.
- punctiformis (Fr.) Karst. var *strigosa* Kalchbr. & Cooke, *Cyphella*: 6, p. 474. Not accepted as a good variety; no specimen available.
- PUNCTULATUM, *CORTICIUM* Cooke: 7, pp. 146.
- punicea, *Thelephora* Alb. & Schw. ex Fr.: 6, p. 63; 7, pp. 126, 154.
= *Tomentella punicea*, but no South African collections in existence.
- puniceus, *Hypochnus* (Alb. & Schw. ex Fr.) Sacc.: 6, p. 63; 7, p. 154.
= *Tomentella punicea*.
- punicea, *Tomentella* (Alb. & Schw. ex Fr.) Schroet.: 6, p. 63; 7, p. 154.
No South African collections in existence.
- PURPUREUM, *STEREUM* (Pers. ex Fr.) Fr.: 6, p. 323.
- pusillum, *Stereum* Berk.: 6, p. 324.
Some of the material is *Stereum thozetii*, other is *Stereum diaphanum*.
- puteana, *Coniophora* (Schum. ex Fr.) Karst.: 6, pp. 34, 36; 7, p. 140.
Most records are *Coniophora fodinarum*, others are indeterminable. None of *C. puteana* yet seen in South Africa.

- radicans, Stereum (Berk.) Burt: 6, p. 324.
 Poor specimen but very doubtful if it matches *Stereum radicans*.
- RAVENELII, STEREUM Berk. & Curt.: 6, p. 325.
- retiruga, Lloydella (Cooke) Bres.: 6, p. 43.
 = *Stereum fulvum*.
- retirugum, Stereum Cooke: 6, p. 325.
 = *Stereum fulvum*.
- RHOINA, SOLENIA W. B. Cooke: 6, p. 481.
- RIMICOLA, PENIOPHORA (Karst.) Höhnelt & Litsch.: 7, p. 151.
- rimosum, Stereum Berk.: 6, pp. 45, 325.
 Material is referred to *Stereum rimosum* var *africanum*.
- RIMOSUM Berk. var AFRICANUM Talbot, STEREUM: 4, p. 945; 6, pp. 38, 325.
- ROSEUS, ALEURODISCUS (Pers. ex Fr.) Höhnelt & Litsch.: 6, p. 470.
 [Syn. *Laeticorticium roseum* (Pers. ex Fr.) Donk: 7, p. 160.].
- ROUMEGUIERII, PENIOPHORA Bres.: 6, p. 22.
- rubiginosa, Hymenochaete (Dicks. ex Fr.) Lev.: 6, p. 50; 7, p. 156.
 Original specimen not seen; rest of South African specimens referred to *Hymenochaete ochromarginata*.
- rubiginosum, Stereum Dicks. ex Fr.: 6, pp. 45, 326; 7, p. 156.
 = *Hymenochaete rubiginosa*.
- rufus, Merulius Pers. ex Fr.: 7, p. 154.
 Material is *Merulius corium*.
- rugosum, Stereum (Pers.) Fr.: 6, p. 326.
 Material is mostly *Stereum rimosum* var *africanum*. Some specimens are *Stereum durbanense*.
- RUMPIANA, ASTEROSTROMELLA Talbot: 4, p. 939; 6, pp. 53, 54.
 (Associated in genus *Scytinostroma* by Donk: 7, p. 160.).
- SALMONICOLOR, CORTICIUM B. & Br.: 6, p. 17.
- SANGUINOLENTUM, STEREUM (Alb. & Schw. ex Fr.) Fr.: 6, pp. 37, 326.
- schomburgkii, Stereum Berk.: 6, pp. 43, 327.
 = *Stereum fulvum*.
- SCUTELLARE, CORTICIUM B. & C.: 6, p. 16.
- SEMISTUPPOSA, HYMENOCOAETE Petch: 6, p. 49.
- serpens, Merulius Tode ex Fr.: 6, p. 33; 7, p. 154.
 No material seen; Doubtful.
- setigera, Peniophora (Fr.) Bres. ex Bourd. & Galz.: 6, p. 21.
 = *Peniophora aspera*.
- SIMULANS, CYTIDIA Lloyd: 6, p. 478.
- sinuans, Thelephora Pers.: 7, p. 126.
 No specimens available. Said by Lentz to be a synonym of *Stereum frustulatum*.
- solani, Corticium (Prill. & Delacr.) Bourd. & Galz.: 7, pp. 136, 146.
 = *Pellicularia filamentosa*.
- spadiceum, Stereum Fr.: 6, p. 327.
 Some material is *Stereum australe* and some *Stereum hirsutum*.
- spongiosa, Cladoderris Fr.: 7, p. 120.
 = *Cymatoderma elegans*.
- spongiosa Fr. var subsessilis Fr., Cladoderris: 7, p. 121.
 = *Cymatoderma elegans*.
- squalidus, Merulius Fr.: 6, pp. 31–33.
 = *Merulius himantoides*.
- strigoso-zonata, Phlebia (Schw.) Lloyd: 6, p. 28.
 = *Punctularia strigoso-zonata*.
- STRIGOSO-ZONATA, PUNCTULARIA (Schw.) Talbot: 7, p. 143.
- subpileatum, Stereum Berk.: 6, p. 327.
 Material is *Stereum durbanense*.
- tabacina, Cyphella Cooke & Phill.: 6, p. 474.
 = *Cyphella variolosa*.

- tabacina, *Hymenochaete* (Sow. ex Fr.) Lév.: 6, p. 327; 7, p. 157.
One specimen not located. The others are *Stereum umbrinum* and a species of *Hymenochaete* which is not *H. tabacina*.
- tabacina (Sow. ex Fr.) Lév. var *australis* Mont., *Hymenochaete*: 6, p. 327; 7, p. 157.
= *Hymenochaete tabacina*.
- tabacinum Sow. ex Fr. var *australis* Mont., *Stereum*: 6, p. 327.
= *Hymenochaete tabacina*.
- tenebrosus, *Stereum* Lloyd: 6, p. 327.
= *Stereum australe*.
- TENUIS, PENIOPHORA (Pat.) Massee: 7, p. 151.
- tenuissima, *Hymenochaete* Berk.: 6, p. 50; 7, p. 151.
One specimen is *Polystictus tabacinus*; the other has not been located.
- TERRESTRIS, THELEPHORA Erhart ex Fr., 7, p. 126.
- THOZETII, *STEREUM* Berk.: 6, p. 327.
- thwaitesii, *Cladoderris* B. & Br.: 7, pp. 122, 123.
South African material included a species of *Favolus* and *Cymatoderma elegans*. True *Cladoderris thwaitesii* is a bleeding species of *Stereum*.
- tomentosum, *Stereum* van der Byl: 6, p. 328.
= *Stereum durbanense*.
- transvaalium, *Stereum* van der Byl: 6, p. 328.
To be taken either as a *nomen confusum* or as a synonym of *Stereum australe*.
- tremellosus, *Merulius* Schrad. ex Fr.: 7, p. 154.
The specimen is *Merulius corium*.
- TRISTICULA, DUORTELLA (B. & Br.) Reinking: 6, pp. 45–48.
- tristricula, *Hymenochaete* B. & Br.: 6, p. 50; 7, p. 157.
= *Duportella tristricula*.
- TUBERCULOSA, PUNCTULARIA (Pat.) Pat.: 6, p. 25; 7, p. 140.
- TUMULOSUM, CORTICIUM Talbot: 4, p. 941; 6, p. 17.
- turgidum, *Stereum* Lloyd: 6, pp. 328, 340.
= *Stereum cinerascens*.
- UMBRINUM, *STEREUM* Berk. & Curt.: 6, pp. 41, 329.
[Syn. *Laxitextum crassum* (Lév.) Lentz: 7, p. 160. *Lopharia vinosa* (Berk.) G. H. Cunn.: 7, p. 160.].
- umbrinus, *Merulius* Fr.: 6, pp. 31, 33.
= *Merulius himantioides*.
- VAGA, PELLICULARIA (B. & C.) Rogers ex Linder: 7, pp. 135, 146.
- vagum, *Corticium* B. & C.: 6, p. 19; 7, pp. 135, 146.
= *Pellicularia vaga*.
- vagum, *Corticium* sensu Burt: 7, pp. 135, 136.
= *Pellicularia filamentosa*.
- vagum var *solani*, *Corticium* Burt ex Rolfs: 7, pp. 136, 146.
= *Pellicularia filamentosa*.
- VARIOLOSA, CYPHELLA Kalchbr.: 6, p. 474.
- vellereum, *Stereum* Berk.: 6, p. 329.
Probably only a form of *Stereum hirsutum*.
- vellereus, *Irpex* B. & Br.: 6, p. 324.
= *Irpex dregeanus* (Reid differentiates *I. vellereus* and *I. dregeanus*: 7, p. 159.).
- velutina, *Peniophora* (DC. ex Fr.) Cooke: 7, p. 152.
The specimen is *Peniophora roumeguerii*.
- versicolor, *Stereum* (Swartz ex Fr.) Fr.: 6, p. 330.
Dubious. The specimens seen are not *Stereum versicolor*. One of them is *Stereum lobatum*.
- villosus, *Stereum* Lev.: 6, p. 330.
= *Hymenochaete nigricans*.
- vitile, *Stereum* Fr.: 6, p. 330.
No specimen in existence. From the description not unlike *Stereum umbrinum*.
- vorticolum, *Stereum* Fr.: 6, p. 330.
= *Stereum purpureum*.

EXPLANATION OF THE ILLUSTRATIONS.

The following lettering has been used throughout the illustrations:—

B	= Basidia.	G	= Gloeocystidia.
BB	= Bulbils.	H	= Hyphae.
C	= Cystidia.	HA	= Habit.
CO	= Conidia.	S	= Basidiospores.
CP	= Conidiophores.	SE	= Setae.
CY	= Cystidioles.		= Surface hairs.
D	= Dendrophyses.		

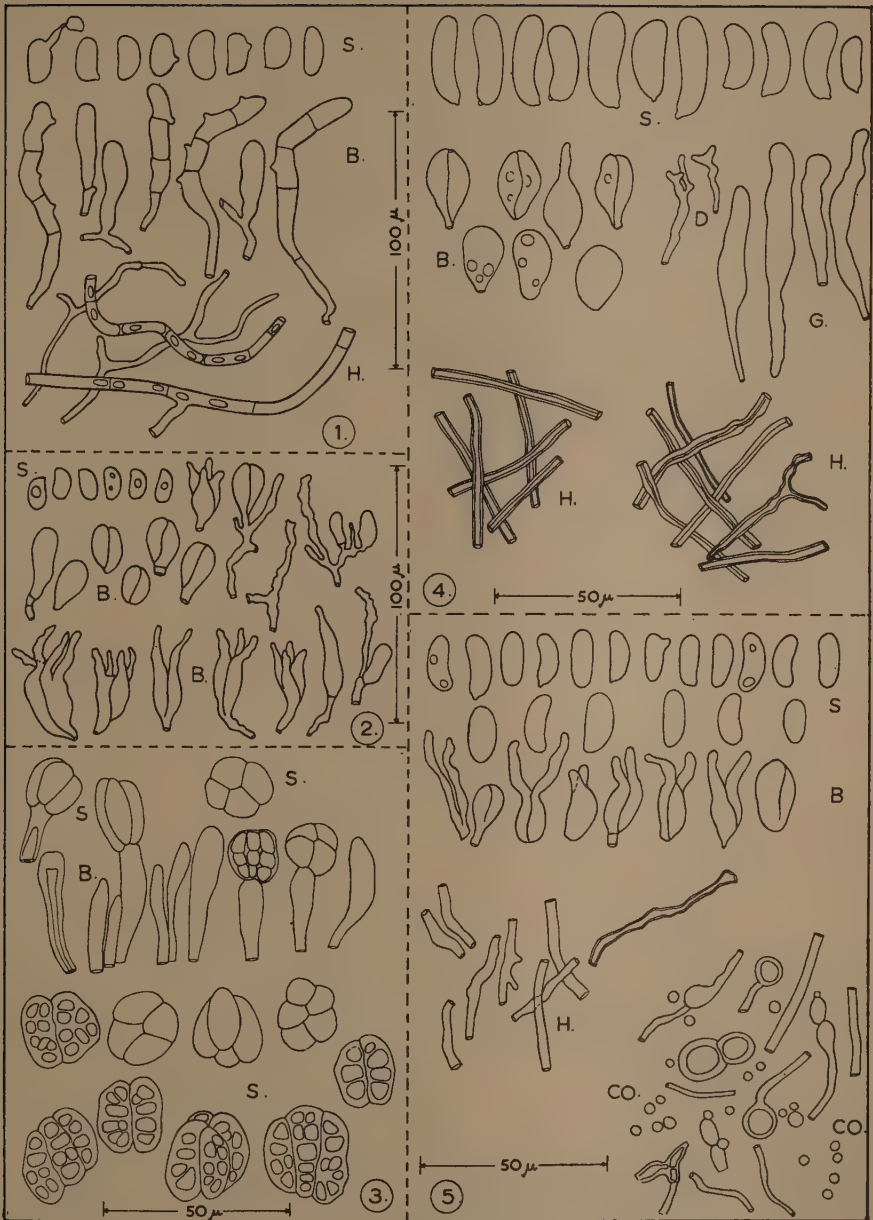


FIG 1.—*Platygloea opalina*. FIG. 2.—*Eichleriella macrospora*. FIG. 3.—*Coniodictyum chevalieri*. FIG. 4.—*Heterochaete grandispora*. FIG. 5.—*Heterochaete byliana*.

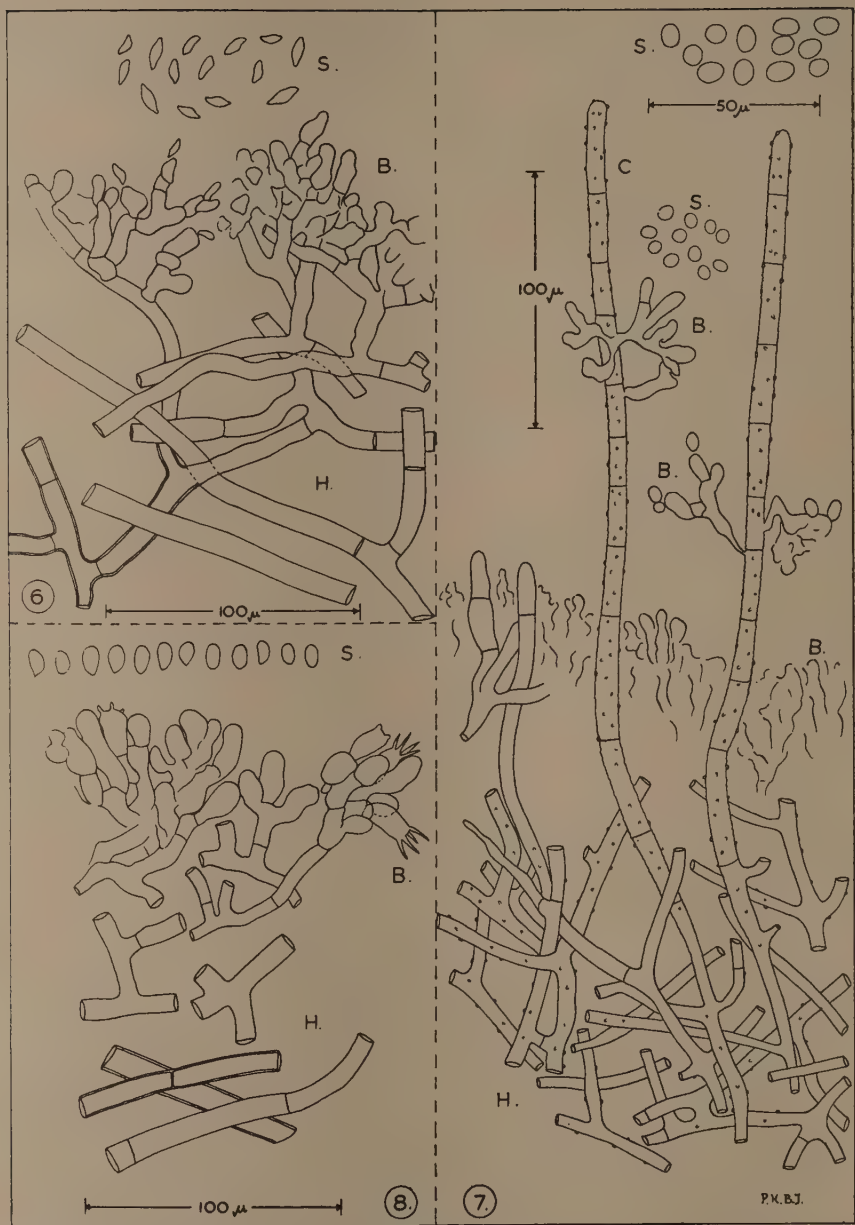


FIG. 6.—*Pellicularia vaga*. FIG. 7.—*Pellicularia fodinarum*. FIG. 8.—*Pellicularia filamentosa*.

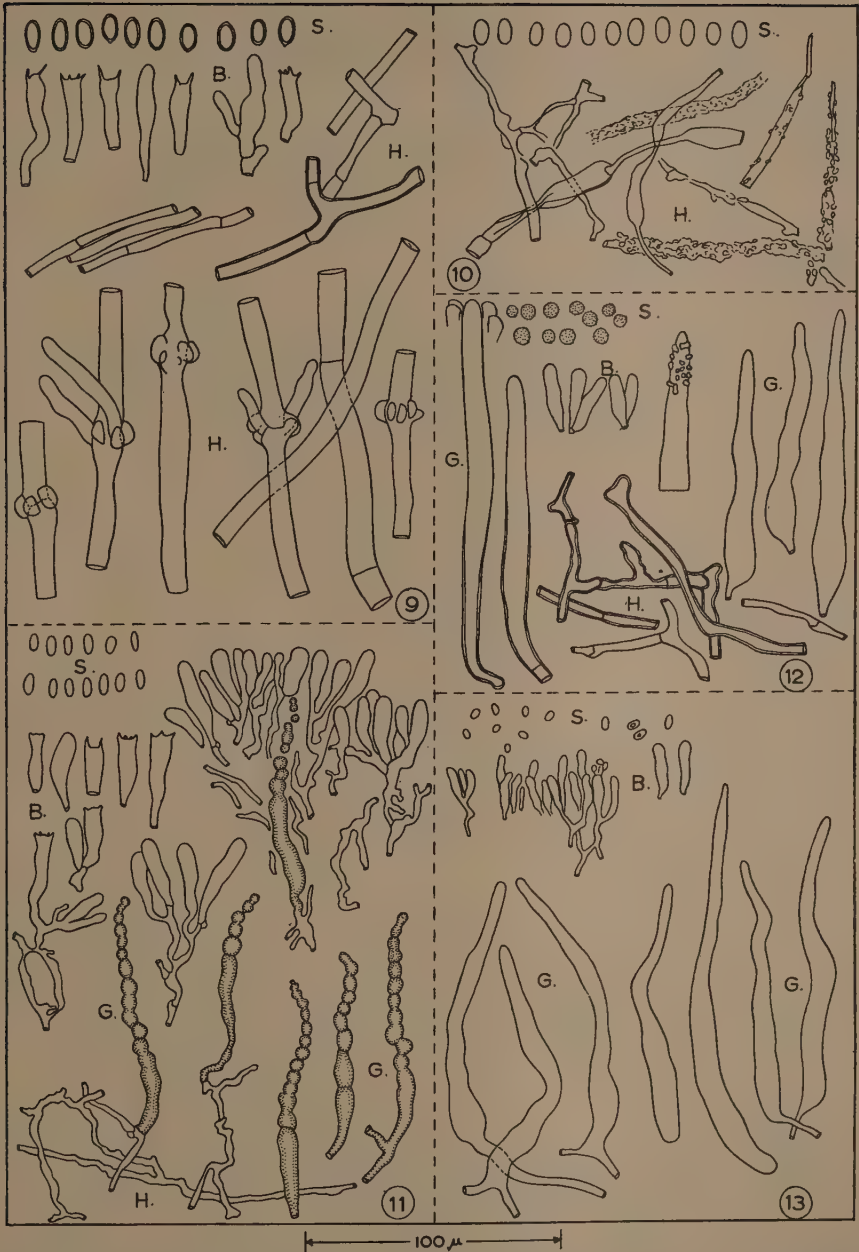


FIG. 9.—*Coniophora arida*. FIG. 10.—*Coniophora incrustata*. FIG. 11.—*Corticium moniliforme*. FIG. 12.—*Corticium punctulatum*. FIG. 13.—*Corticium porosum*.

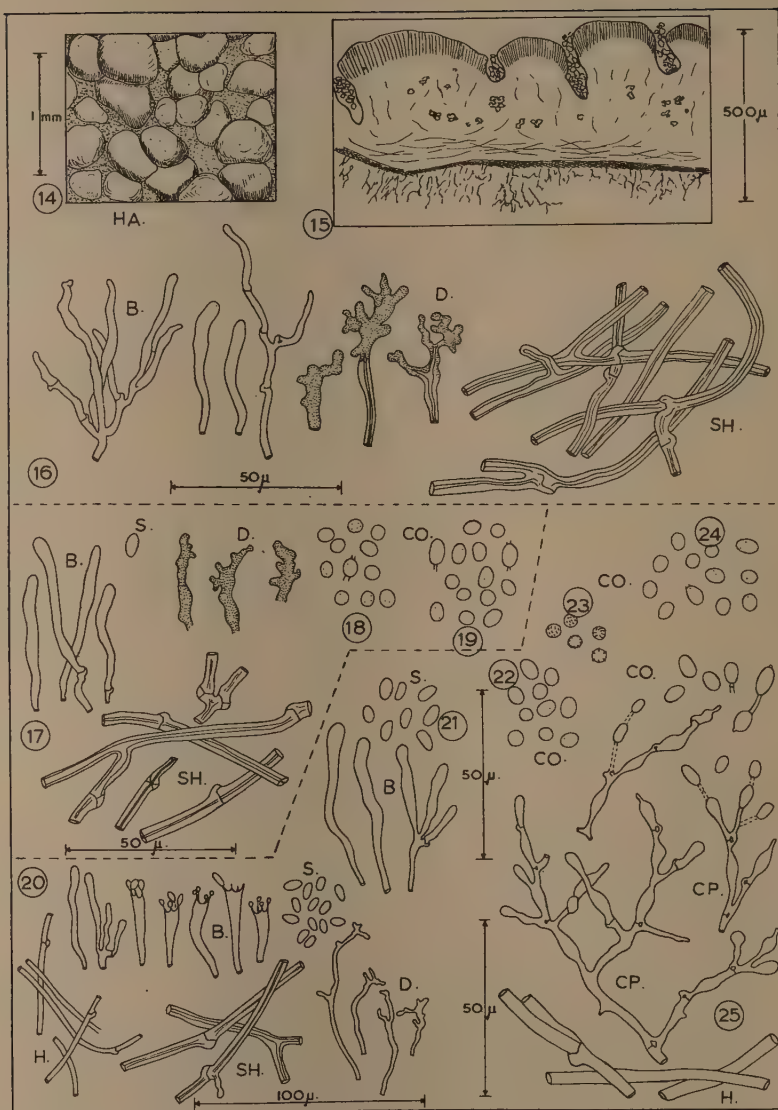


FIG. 14.—*Punctularia tuberculosa*, Type, hymenial surface. FIGS. 15, 16.—*Punctularia tuberculosa*, Type. FIG. 17.—*Corticium conigenum*, Type, basidia. FIG. 18.—*C. conigenum*, Type, conidia from bark. FIG. 19.—*C. conigenum* Type, conidia from culture. FIGS. 20–25.—*Punctularia tuberculosa* (No. 40510). FIG. 22.—Conidia from young culture. FIG. 23.—Conidia from old dried culture. FIG. 24.—Conidia from bark. FIG. 25.—Conidia and conidiophores in slide culture.

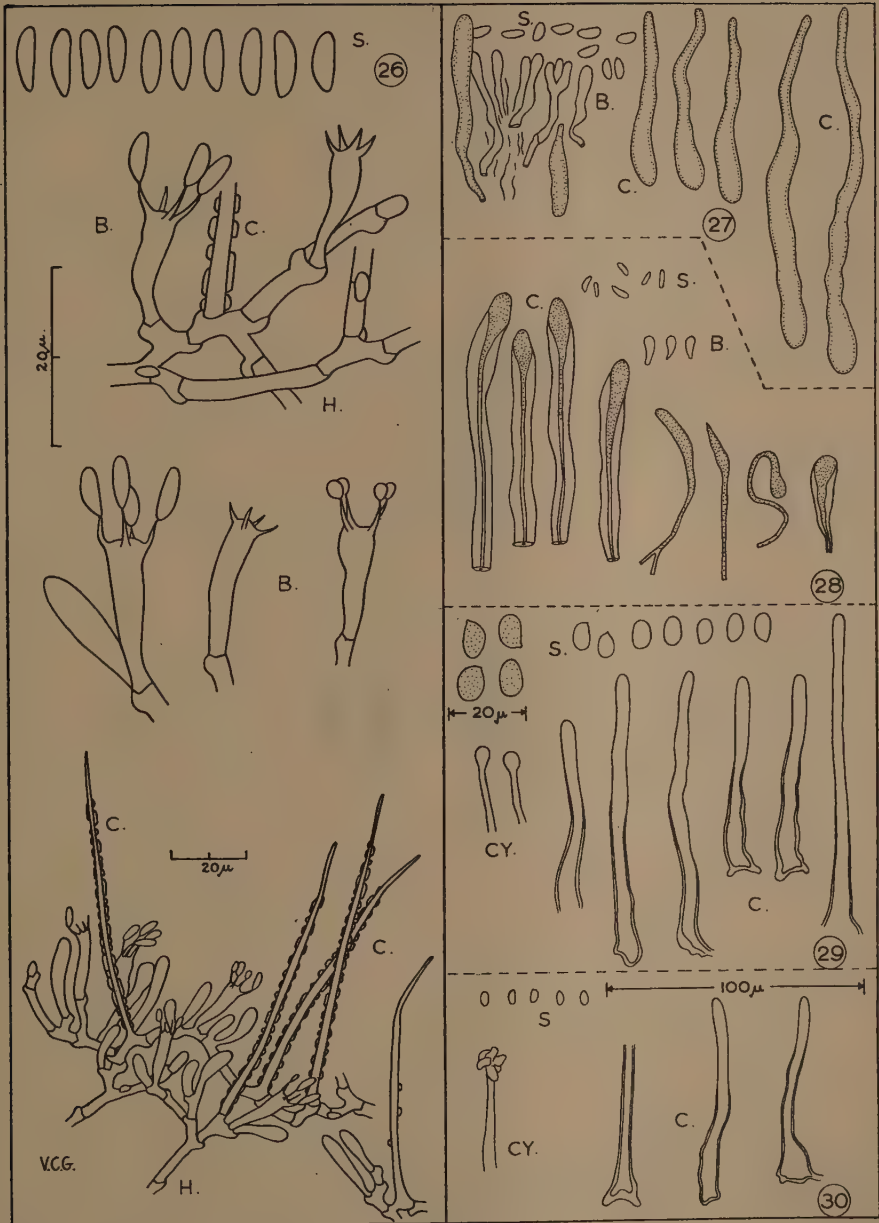


FIG. 26.—*Peniophora longispora* var. *brachyspora*, Type. FIG. 27.—*Peniophora tenuis*. FIG. 28.—*Peniophora gracillima*. FIG. 29.—*Peniophora rimicola*. FIG. 30.—*Peniophora pruinosa*.

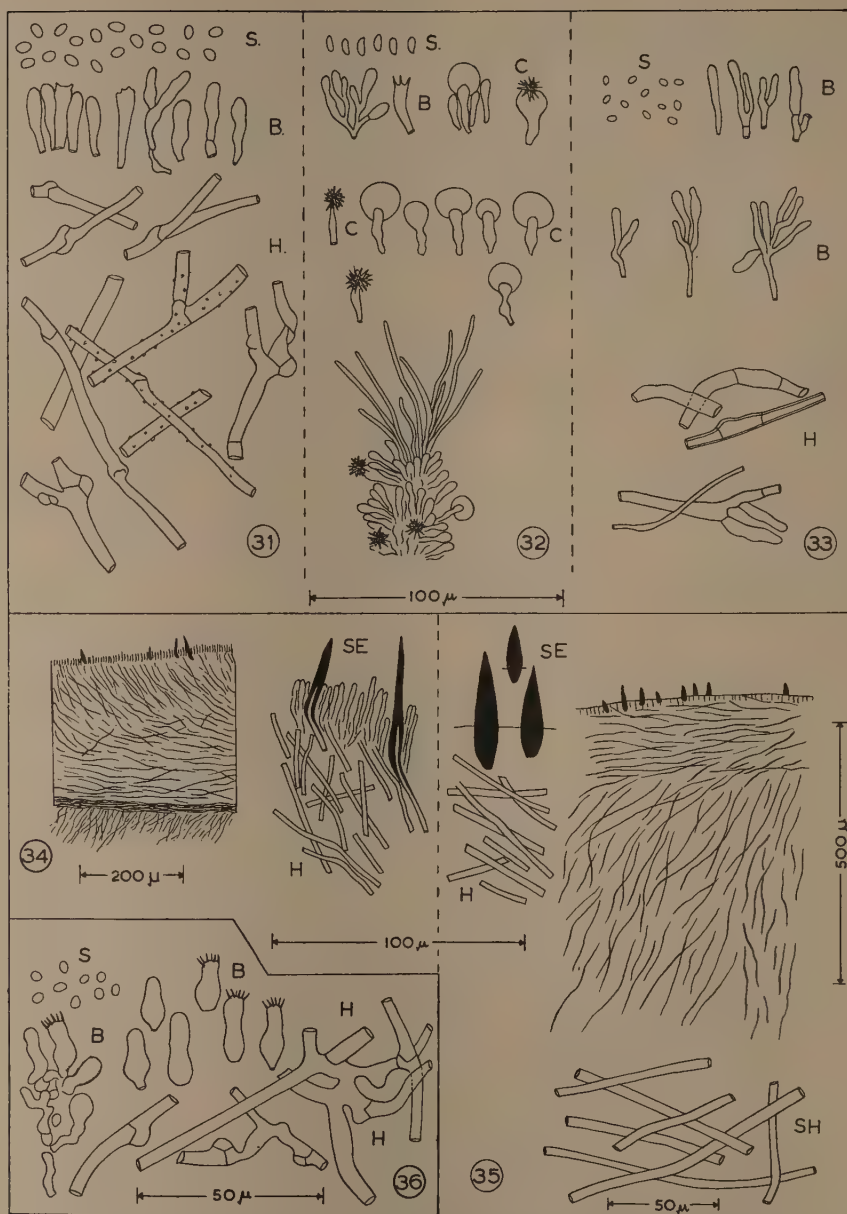


FIG. 31.—*Merulius molluscus*. FIG. 32.—*Odontia bicolor*. FIG. 33.—*Grandinia rosea*.
 FIG. 34.—*Hymenochaete luteobadia*. FIG. 35.—*Hymenochaete nigricans*. FIG.
 36.—*Sistotrema muscicola*.

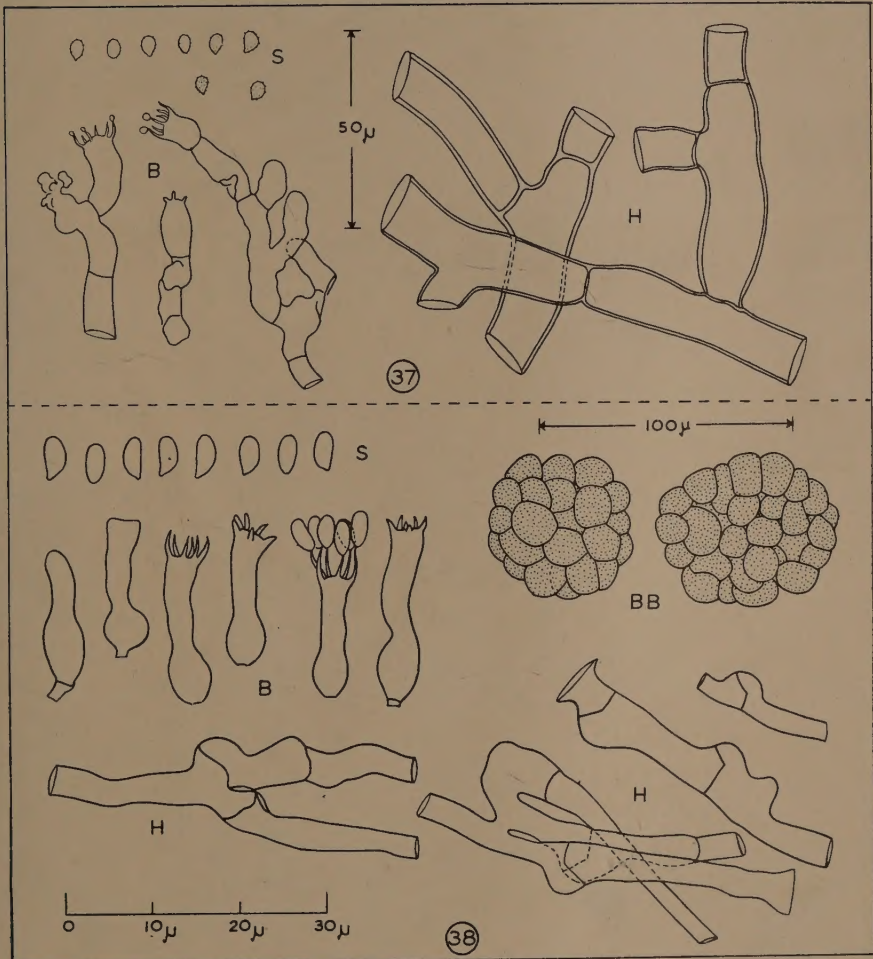


FIG. 37.—*Pellicularia asperula*. FIG. 38.—*Sistotrema brinkmanni*.

